

# The Flora and Vegetation of Wye and Winchcombe Downs National Nature Reserve

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Report to Natural England

Commissioned by Piers Griffin



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## Introduction

Wye Downs is a National Nature Reserve on the western edge of the North Downs just east of Ashford in Kent, running (intermittently) from Winchcombe in the north (TR0849) to Bulltown Corner in the south (TR0843); in total about 5 km long and 141 ha of chalk escarpment on two separate outcrops. Almost all the land within the reserve is on the steep slopes, with only a narrow strip of flat ground at the top and the bottom. It includes most of the botanically rich parts of this section of the Downs, with intensive farmland and forestry occupying the remainder. The NNR was created in 1961, initially from farmland bought by the entomologist Charles Duffield, although it has been extended several times since then. Most of the NNR is owned and managed by Natural England, with the exception of the Crown Field (compartment 35), which was until recently owned by Imperial College, London, but is now in private ownership.



The escarpment at Winchcombe Down, showing arable land below and woodland above

This report was commissioned by Piers Griffin, the NNR site manager, in August 2019. The intention is to provide an assessment of the flora and vegetation of the reserve with an analysis of its value and conservation interest. As times change and our knowledge grows, statements that may have seemed accurate in the past may no longer be considered true or useful, and the intention is to review them here, in the light of the information now available. Circumstances will of course continue to change in the future, so I have attempted to present facts as fully as possible and reference all sources so the reader can make up their own mind.

The NNR is best known for its orchids. With at least 22 species and hybrids having been recorded, it is possibly the most orchid-rich site of its size in Britain. It also has a small population of the rare Black-veined Moth and numerous other rare and scarce species. The habitat is grassland, scrub and woodland, which exist in an uneasy balance that is largely determined by the management regime.

Many visitors are attracted to the reserve every year to appreciate the wildlife and the views across the countryside. Like the other National Nature Reserves, it has been studied quite intensively since its establishment, but these works can be lost over time and it is important to bring them together for preservation and to make further use of them. I have incorporated all the relevant studies I can find into this report and compiled a reference list for use by the reader.

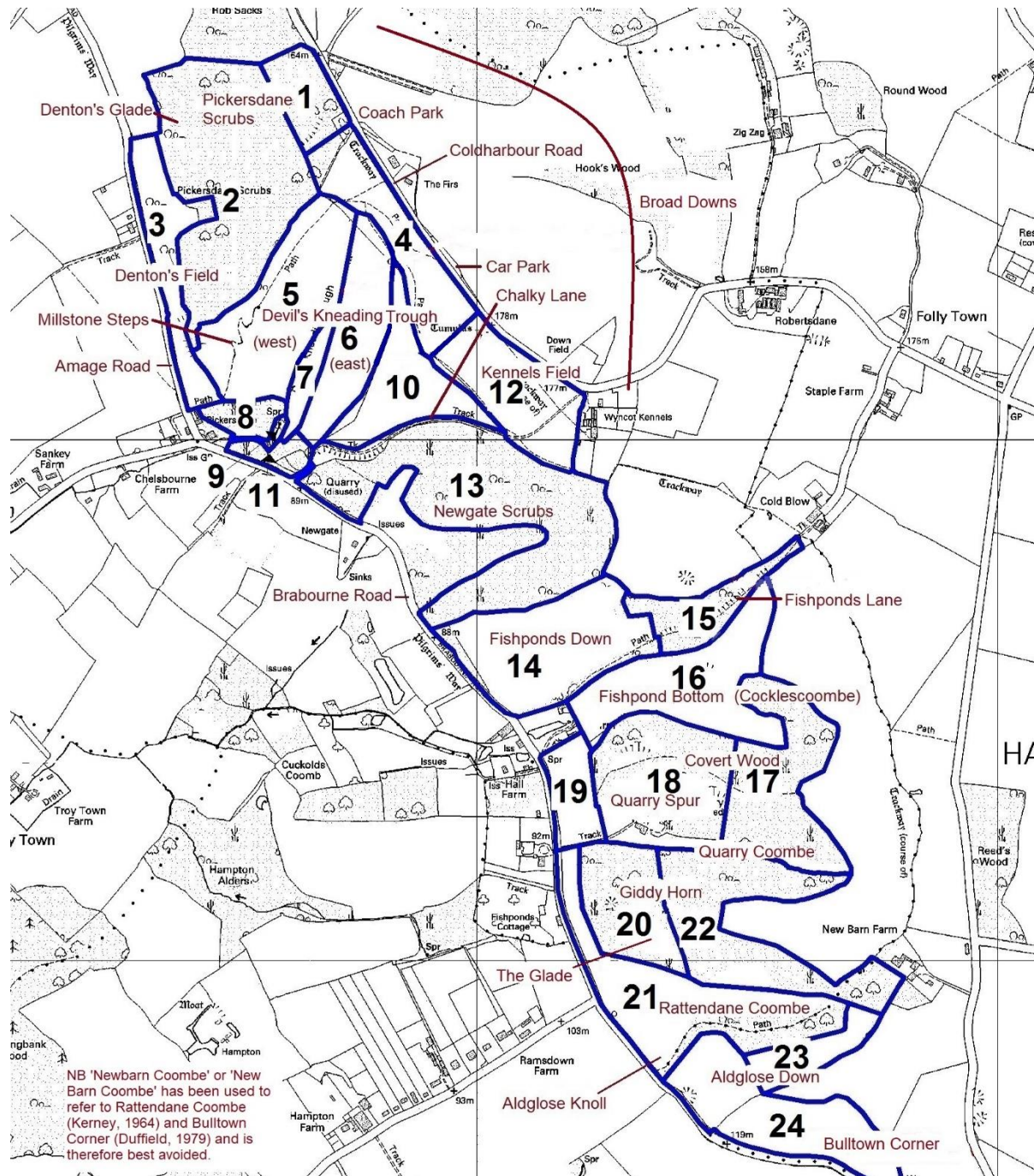
Anyone surveying the Downs will be struck by the changing vegetation over the seasons. From early spring onwards, it is remarkable how wave after wave of plants come into flower, some of them disappearing within a few weeks to leave no trace. It is particularly challenging for the surveyor, who must attend almost every week in the spring to identify each species of orchid, and who will still be doing this in October to find the ladies-tresses and gentians.

This report is ongoing: check the date at the front to see if you are likely to have the current version. The contents page is interactive in Word and pdf formats: click on the listing to jump to the relevant page. As there is no index and the species are given in taxonomic order, it can be quickest to search for part of a plant's name (abbreviations are deliberately not used in the primary listings to facilitate searches). Appendix 1 also lists all species in alphabetical order. Names of species follow Stace's New Flora, 4<sup>th</sup> edition (2019) with some modifications. Throughout the document I have tried to reference compartments using the abbreviations C1, C2 etc., to enable searching, while names are also given to make it more readable. There is of course a database which provides more detail than can possibly be included in a written report, and this is also available for study and analysis.

A copy of this report has been uploaded to the Internet Archive (<https://archive.org/>) for long-term storage and to make it available to everyone.

## Site Plan

Map of the main part of the reserve (refer to the Descriptions of the Compartments section for maps of Crown Field and Winchcombe Down). The management compartments are numbered and referred to throughout this report as C1, C2, etc., and recommended names for the various areas and features are given.



## History

The earliest records for the Wye Downs are by Gerard E. Smith (1805-1881). He was at that time a student at Oxford and he later became a vicar in Kent. In 1828 he visited the Downs near Folkestone and noticed that some of the orchids were different. This turned out to be the first British find of Late Spider Orchid, *Ophrys fuciflora* (at that time known as *O. arachnites*). Smith was invited to submit accounts of this species (and of a Sea Lavender, *Statice binervosa*) to the next edition of James Sowerby's English Botany.

With these discoveries, Smith embarked on a Catalogue of the Plants of South Kent, which was published in 1829. It contains the earliest known records for the Wye Downs, notably Frog Orchid (*Coeloglossum viride*) and Lady Orchid (*Orchis purpurea*) (although not, apparently, *Ophrys fuciflora*).

Ten years later he annotated his Catalogue with additional records which were published by M.H. Cowell in 1839. This adds Burnt Orchid (*Neotinea ustulata*) to the list.

These records, and in fact almost all records for the Downs until the last ten years or so, cannot be reliably attributed to a location within the NNR. The policy I have adopted here is to include all records which seem to be for this part of the Downs, stretching from Winchcombe to Bulltown Corner, on the grounds that National Nature Reserves are chosen to be representative of the best habitats of the region. As such, it is useful to have a list of the characteristic species of the habitat, even if some of those are not known for certain to have been within the site. Where this is any doubt, this is clearly stated in the species accounts.

In Cowell's 1839 Floral Guide for East Kent is one record by H.B. Mackeson of juniper in 'woods near Brooke.' That is a reasonably good description of Newgate or Pickersdane Scrubs (amongst other places) but probably not of 'The Junipers' near Wye, which is further north. It seems likely that juniper was once widespread in this area, but it is now long gone (except when planted).

A list of plants within three miles of Wye, contributed by G. Freeman, appears in William Morris's History and Topography of Wye (1842). Not much is known about Freeman. He is not otherwise renowned as a botanist and there is no record of him having made a herbarium. I have not yet seen his full list but have merely seen those records which were abstracted by Hanbury & Marshall in their Flora of Kent. Freeman makes no mention of any place names that are helpful to us, but he does list some calcicoles that are characteristic of this site, such as *Atropa belladonna*, *Clinopodium ascendens*, *Hypericum androsaemum* & *Primula \*polyantha*.

In 1867 the East Kent Natural History Society made an excursion to Wye Downs, during which Jas. Reid and George Dowker made a list of the plants they had seen. Their list is given below. It is a curious one, with some plants you would not expect to find in this area, or even in the county. *Orchis militaris* might well be a confusion over names, but *Ranunculus hederaceus* seems unlikely. *Carex paniculata* might have been in wet meadows by the river. From the brief account, it seems that they probably stuck to the area around the Olantigh estate, and so their records are not really applicable to the NNR. For now, I have excluded them from this report, except to list them here.

### Records by Reid & Dowker, 1867

Ajuga reptans	Cephalanthera damasonium	Galium aparine
Alliaria petiolata	Cerastium fontanum	Galium odoratum
Allium ursinum	Coeloglossum viride	Geranium molle
Anacamptis morio	Conopodium majus	Geranium robertianum
Anthoxanthum odoratum	Cornus sanguinea	Geum urbanum
Anthriscus sylvestris	Crataegus laevigata	Glechoma hederacea
Asplenium adiantum-nigrum	Cruciata laevipes	Helianthemum nummularium
Asplenium ruta-muraria	Cytisus scoparius	Lamium galeobdolon
Asplenium trichomanes	Dactylorhiza fuchsii	Lepidium campestre
Bellis perennis	Dryopteris filix-mas	Linum catharticum
Brassica rapa	Equisetum fluviatile	Lotus corniculatus
Caltha palustris	Euonymus europaeus	Malus domestica
Cardamine pratensis	Euphorbia amygdaloides	Melica uniflora
Carex caryophylla	Euphorbia helioscopia	Mercurialis perennis
Carex paniculata	Fragaria vesca	Moehringia trinervia



Myosotis arvensis	Ranunculus aquatilis	Silene vulgaris
Neotinea ustulata	Ranunculus auricomus	Sisymbrium officinale
Neottia ovata	Ranunculus bulbosus	Sonchus arvensis
Onobrychis viciifolia	Ranunculus hederaceus	Stellaria holostea
Ophrys insectifera	Ranunculus repens	Stellaria media
Ophrys sphegodes	Reseda lutea	Trifolium pratense
Orchis mascula	Rhinanthus minor	Trifolium repens
Orchis militaris	Ribes uva-crispa	Ulex europaeus
Oxalis acetosella	Rosa canina	Veronica agrestis
Paris quadrifolia	Rubus fruticosus	Veronica arvensis
Pilosella officinarum	Sambucus nigra	Veronica chamaedrys
Plantago media	Sanicula europaea	Veronica serpyllifolia
Polygala vulgaris	Scandix pecten-veneris	Viburnum lantana
Potentilla anserina	Sherardia arvensis	Viburnum opulus
Poterium sanguisorba	Silene dioica	Vicia sepium
Primula veris	Silene flos-cuculi	Viola tricolor
Ranunculus acris	Silene latifolia	

The next significant event was a visit by John Firminger Duthie (1845-1922) in 1871, who discovered *Polygala austriaca* (= *P. amarella*, Dwarf Milkwort) on the Downs. He returned two weeks later with W.W. Newbould to see it again, and subsequently with F.J. Hanbury. The original location was described as 'rough chalky ground on the border of a copse wood above Coombe Farm,' which is rather vague, particularly as the maps don't show a farm of that name. Although there are also Cuckolds Coombe (aka Cocklescoombe), Brabourne Coombe, Coombegrove, Little Coombe and Winchcombe to choose from, I assume that Big Coombe (named Coombe Manor on modern maps) is the one intended.

From the 1870s to the 1890s there are many more records for the Downs, compiled by Frederick J. Hanbury (1851-1938) and Edward S. Marshall (1858-1919) for their Flora of 1899. This gives lists of species in the Botanical Divisions, which divide the county into ten units based largely on the geology. Wye Downs is in Div. 7, which encompasses all the chalk between Canterbury and Wye down to Dover and Folkestone. The records often just say 'common on the chalk,' or something like that. One *could* interpret that as being a record for the NNR if one chose to, but there seems little point in doing so. The most useful parts of the Flora are the detailed records of rare plants, which are often given more precise location. Few of the records have dates but most relate to the period 1875-1899.

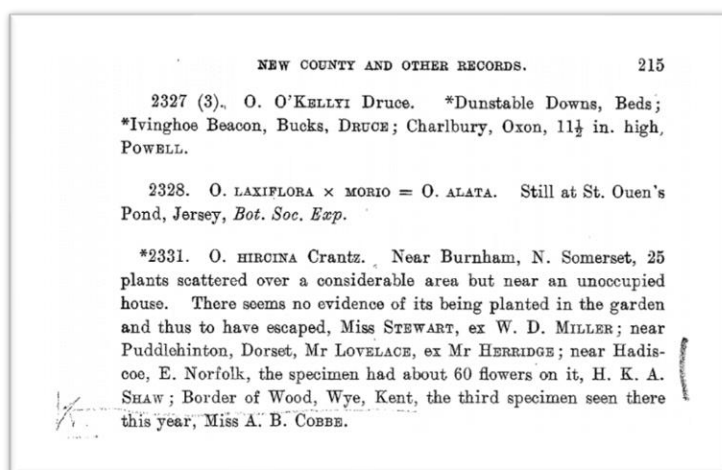
#### Species listed in Hanbury & Marshall (1899)

Carduus crispus	Wetted Thistle	Orchis anthropophora	Man Orchid
Cephalanthera damasonium	White Helleborine	Orchis purpurea	Lady Orchid
Filipendula vulgaris	Dropwort	Pimpinella major	Greater Burnet-saxifrage
Herminium monorchis	Musk Orchid	Polygala amarella	Dwarf Milkwort
Hypopitys monotropa	Yellow Bird's-nest	Polygala vulgaris	Common Milkwort
Juniperus communis	Juniper	Prunus domestica	Wild Plum
Milium effusum	Wood Millet	Rhamnus cathartica	Buckthorn
Neotinea ustulata	Burnt Orchid	Ribes rubrum	Red Currant
Ophrys fuciflora	Late Spider-orchid	Thymus pulegioides	Large Thyme
Ophrys sphegodes	Early Spider-orchid		

From this time, specimens from Wye Downs begin turning up in herbaria. It is very laborious to acquire data from museum collections because they are generally uncatalogued, but during the 2000s and 2010s I organised a project with Tom Humphrey called Herbaria at Home (<http://herbariaunited.org/atHome/>), during which we took photographs of all the sheets in several national collections and used crowd-sourcing to catalogue them in detail. We only worked through a few herbaria – a tiny fraction of the millions of pressed plants stored in museums around the country – and my aim at the time was to gather data on v.c. 40 (Shropshire), so anything relating to Kent was merely by-catch but, even so, the website contains a fair number of plants collected at Wye.

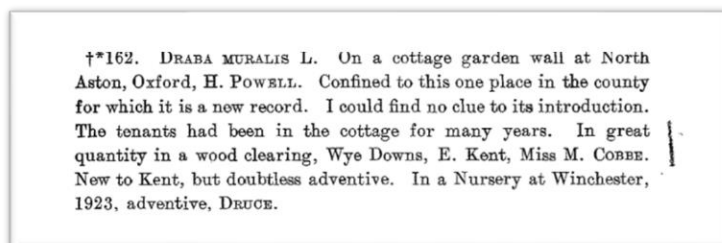
The earliest ones are by Prof. Duthie, who made his numerous collections of *Polygala amarella* between 1871 and 1875. There are plants in Birmingham (BIRM), Bolton (BON), Manchester (MANCH), the Natural History Museum (BM) and, doubtless, many other collections. It seems he did not quite manage to eradicate it, because Marshall managed to find some in 1888 (CGE, SLBI) as did Hanbury in 1897 (BM, CGE). By 1898 George Claridge Druce (1850-1932) found it to be still "quite plentiful in one spot" (BM), when he gathered some more. The plundering did not stop there, however, as H. Stanton also gathered it in 1898 (BM), John Percival (1863-1949) and Charles Edgar Salmon (1872-1930) in 1900 (BM), Cecil Prescott Hurst (1863-1956) in 1901 (MANCH), Mrs Mary Louisa Wedgwood (1854-1953) in 1909 (BIRM) and W.H. Hammond in 1927 (SLBI). One can imagine it must have been pretty thin on the ground by this time.

Returning to the general species list for the site, in 1899 – presumably too late for inclusion in the Flora – Hanbury found *Himantoglossum hircinum* (L.) Sprengel, Lizard Orchid, 'near Wye.' It was subsequently recorded several times until 1923, when the report below by Amy Beresford Cobbe (c. 1866-1952) appeared in the Botanical Exchange Club Report. This turned out to be the last time it was seen there. The precise location was a field margin at Olantigh, on the edge of The Junipers (TR0647), which is not within the NNR. It is a rather ruderal plant when away from coastal dunes, and it is not at all characteristic of the site. It is no great surprise that it did not persist.



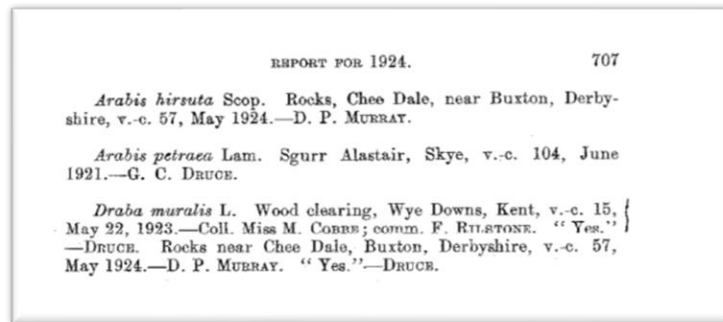
Extract from the Botanical Exchange Club Report for 1923 (vol. 7, part 1). This was from Francis Rose's own set of BEC Reports, and his annotation draws attention to the Kent record

That same year Miss Mabel Cobbe (d. 1936) (sister of Amy) found *Draba muralis*, Wall Whitlowgrass, in a wood clearing on the Wye Downs. It is tempting to think this might have been in The Junipers, spotted whilst they were looking for the Lizard Orchid, but there is no evidence for this. The record was so unusual that it must have been questioned, because the following year Francis Rilstone (1881-1953) sent the BEC some of her specimens, which were confirmed by George Druce, so the identification is not in doubt (BEC Rep. vol. 7 p. 707, 1924).



Extract from the Botanical Exchange Club Report for 1923 (vol. 7, pt. 1, p. 167)





Extract from the Botanical Exchange Club Report for 1924 (vol. 7, pt. 4, p. 707)

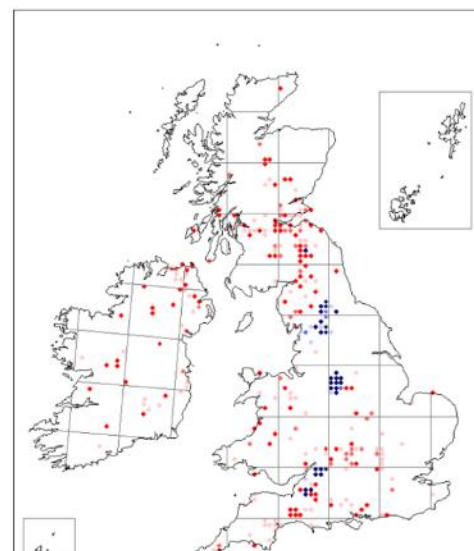
*Draba muralis* is a plant of calcareous woodlands and limestone exposures, generally considered to be native on the Mendips, Peak District and Pennines, but introduced ('adventive') elsewhere. In the recent Atlas of the Kent Flora, Philp (2010, p. 93) even describes it as a neophyte, which suggests that it might be a garden escape; but it seems unlikely that many people would grow it as a garden plant.

Cobbe's record of *D. muralis* was thought until now to be the only one ever made in the county, and it was assumed at the time that a population so far from the accepted native range must have been introduced in some way. However, there is some inconsistency in the way these things are handled. *Draba muralis*, like many other limestone plants, is often found in quarries, on dry stone walls and other places away from its putatively native habitats. It is widely distributed throughout Britain, sometimes in short-lived, 'casual', populations, and sometimes persisting for a hundred years or more in favourable sites. In this respect it is rather like Rue-leaved Saxifrage (*Saxifraga tridactylites*), Black and Maidenhair Spleenworts (*Asplenium adiantum-nigrum* and

*A. trichomanes*), and Fern-grass (*Catapodium rigidum*). All these species are happily accepted as native wherever they grow, even when there are no natural limestone outcrops for them in the vicinity, as in Kent. The reason *D. muralis* is treated differently is simply that botanists have put considerable effort into classifying its populations as native or non-native, presumably in order to maintain its status as Nationally Scarce, when really it is too common for that.

The question remains, therefore, what was the origin of the plants at Wye? That it was introduced either as a garden escape or with forestry operations seems rather unlikely. Moreover, it has recently come to light that it had been known at Wye for at least 20 years before Miss Cobbe found it. There is a specimen at SLBI that was collected in 1904 by W.H. Hammond, and plants from there were in cultivation by W.H. Griffin in 1905 (SLBI). These demonstrate that it was not a short-lived garden escape that Mabel Cobbe found, but a population that had been there for some time.

There are two plausible explanations for the plants at Wye: either they are part of a mobile meta-population of widely dispersed colonies, or they arose from buried seed and are indicative of a habitat that has been lost. There is no way to answer that at present, but it is intriguing to think that the chalk woodlands of the south of England may be a former habitat for this rather northerly species. It is, incidentally, a widespread plant throughout Europe and into Asia, so Kent is well within its global range. By comparison with the plants identified from palynological evidence (Lambert, 1964), it does not seem at all unlikely as a native at Wye at some point in the past.



The New Atlas map of *Draba muralis*, showing its somewhat arbitrary division into native (blue) and non-native (red)

The period from the 1870s to the 1940s seems to have been a good time for spotting orchids and, more significantly from our point of view, for digging them up. Orchids make very poor-quality pressed plants, as they lose their colour and the flowering spikes squash into an unappealing mush. Nevertheless, they were gathered in huge numbers. Lady Orchid seems to have been the most sought after, and there are specimens at BIRM (Hanbury, 1878; F.H. Ward, 1888; L. Kitching, 1889), BON (Duthie, 1871), MANCH (C.P. Hurst, 1901) and SLBI (Hanbury, 1878; J.F. Jeffrey, 1873; W.H. Hammond, 1902; W.H. Griffin, 1902; G. Richardson, 1914 & R.B. Ullman, 1928). Hundreds of specimens must have been taken from the Downs. White Helleborine, Musk Orchid, Man Orchid, Burnt Orchid, Fly Orchid and both Early and Late Spider-orchids are also to be found in the herbaria we have digitised. The last specimen to have been collected (according to our limited dataset) was as recently as 1955 (*Ophrys fuciflora*, F. Rose, MNE). The extent to which collecting is responsible for the decline of the populations is not entirely clear. For some species (e.g. the Lady's-slipper Orchid in Derbyshire) it is known to have been responsible for the elimination of an entire species from Britain. Some plants have recovered from intensive collecting while others have gone into decline owing to habitat changes rather than collecting. Green-winged Orchid, for example, used to be so abundant that it was not of any interest to collectors, but it is now extremely rare at Wye and uncommon anywhere. On balance, it seems very likely that certain species must have been brought close to extinction by botanical collectors, which renders them unable to recover under anything less than entirely favourable management conditions. Fortunately, the fad for collecting faded with the development of illustrated identification guides, and it is now very much frowned upon to pick an orchid and, in some circumstances, illegal.



A sheet with three specimens of Lady Orchid in the Birmingham University herbarium

From about 1943, and continuing into the 1980s and even '90s, Francis Rose was actively recording the plants of the county and compiling data for a traditional Flora – lists of locations of plants organised by botanical district. Rose ignored Hanbury & Marshall's botanical districts and instead developed his own system, under which the Wye Downs fall into Division 8, encompassing the central part of the North Downs.

Rose's manuscript was never published, but Geoffrey Kitchener has recently put much effort into reconstructing it and has made it available in electronic format. It adds several interesting records for a period when botanical recording was at a low ebb and it is particularly comprehensive for information about orchids. Over the years, Rose himself added 3 species of plants to the site list: *Epipactis helleborine*, *E. purpurata* and *Ophrys apifera*.

**O. insectifera x sphegodes = O. x hybrida** Pokorny

Sepals of *sphegodes*: petals like *insectifera*: lip brown, almost as narrow as *insectifera*.

**8)** Long plant[atio]n, Olantigh, Wye, 1913. Wye Downs, 1905: G. Richardson, Misses Harris & Walker. 087498 Down N. of Winchcombe Farm, Crundale, 1956, BJB; 1957, C.N. Pope (1957!); 2 in 1960, D. Lang.

**O. sphegodes** Miller

15, [16]

7/52

Early Spider Orchid

Native. Chalk grassland: rare, but locally very abundant in 7) at Queendown Warren; and in 8) near Wye, and in many places near the coast between Etchinghill and Deal. Apparently extinct in W. Kent. Extinct as a native in Surrey; still locally abundant in a few localities in E. Sussex, and rare in one locality in W. Sussex: extinct in Essex: extremely rare in Pas de Calais (Boffles!). The Queendown Warren plants flower always three weeks earlier than those of eastern Kent.

[ 5 ] W of South Street, Biggin Hill, 1947, teste D.E. Keramins.]

[ 6 ] Paddlesworth Downs, FJH: Fl. K. Field nr. Culverstone School, 1920? E.G. Brand. Reported on down NW of Crookhorn Wood, Snodland, c.1926 by F. Forsyth.]

Example of an account from the reconstructed Flora of Kent by F. Rose

In 1961 the Nature Conservancy acquired the first part of Wye Downs from a local landowner, Charles Duffield (1896-1974) as a National Nature Reserve. Duffield was a keen entomologist who had studied and worked at Wye College and for Coopers, a company that manufactured sheep dip and other insecticides. He initially bought Pickersdane Farm in 1925 and then added the Devil's Kneading Trough in 1936. While he was the owner, general naturalists were welcome, but butterfly collectors were strictly forbidden (rather ironically, considering the damage that botanists had been causing). Under his terms for the sale of the land, his son became the first warden of the reserve.

CHARLES ALBAN WILLIAM DUFFIELD, M.C., J.P., died in December 1974 in his 88th year. A Fellow from 1913-40, he was re-elected in 1947. When he came down from Cambridge Duffield studied economic entomology at Wye College and became a professional entomologist, working under Theobald at the College and devoting himself for the most part to aphids and frog-hoppers on which he published several papers. After Theobald's death he entered commercial life as entomological adviser to the Cooper Technical Bureau. In 1935, an inheritance enabled him to resign this appointment and purchase land round his home, near Ashford, Kent.

As a lover of the countryside Colonel Duffield was particularly concerned with the conservation of rare insects and plants in his own area of Kent. His knowledge proved most useful when he served on the Society's Committee for the Protection of British Insects in the early 1950's. A few years ago some of his land was acquired by the Nature Conservancy and now forms part of the Wye and Crundale Down National Nature Reserve. Colonel Duffield's collections, representative of the insects of East Kent, will be placed on loan in the Maidstone Museum.

Obituary of Co. Duffield from the Proceedings of the Royal Entomological Society of London, 1875

Under the 1949 National Parks Act the NNRs were to be a representative sample of the best habitats and landscapes in Britain and were to be used 'for the study of, and research into, matters relating to the fauna and flora of Great Britain and the physical conditions in which they live,' and/or for 'preserving flora, fauna or geological or physiographical features of special interest.'

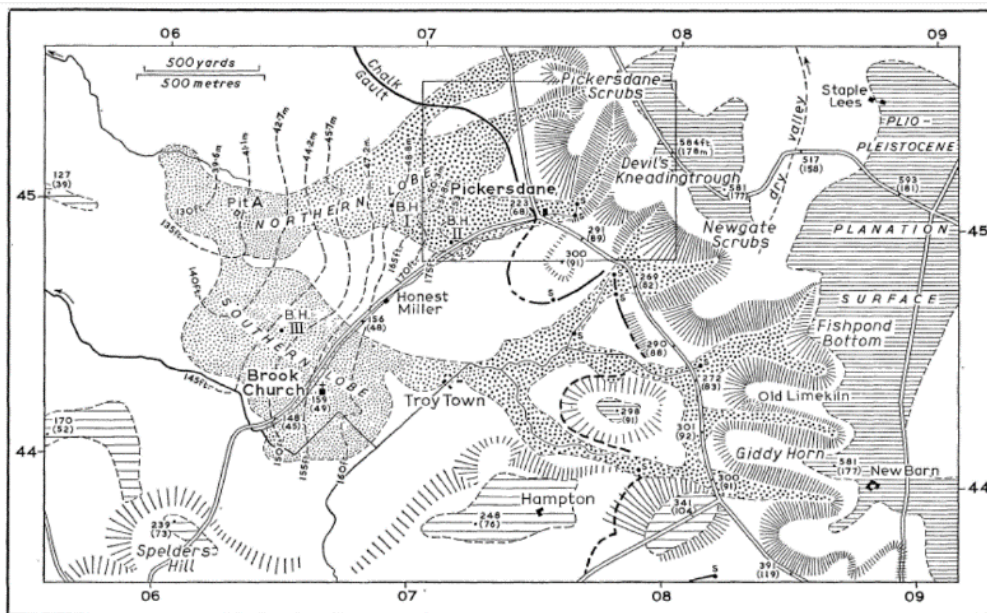
It is interesting to note how prominently 'research' features in this legislation, coming before even the conservation of the species under study. The tradition of carrying out ecological studies on the NNRs has led to numerous publications over the years; there is more written about these sites than about any other type of landscape in Britain.

The earliest such study that I have managed to trace is a paper by Michael Kerney and colleagues at Imperial College, London, in 1964. It shows how the seven main coombes in the NNR were created in a short period of



time between 8,800 and 8,300 BCE. It seems that the climate then was cold and moist enough for the chalk to be shattered by frost each winter and for the fragments then to be washed down into the valley below by meltwater in the spring. Two broad fans of pulverised chalk spread out across the countryside around where the village of Brook now stands, and Kerney calculated that there is enough debris there to have filled the gaps left in the escarpment by the coombes. Radiocarbon dating of the layer above these fans provides an endpoint for this process. This demonstrates clearly that the coombes were created during that time, and that erosion has not continued on any scale since then.

The vegetation ten thousand years ago was what we would now associate with the Scottish Highlands, or even colder climes. The main shrubs were *Actostaphylos uva-ursi*, *Betula nana*, *Juniperus communis* and *Salix herbacea*, while the herbs included *Rumex acetosella*, *Viola* sp., *Chaenorhynum minus* and an *Ephedra* which no longer occurs in Britain (Lambert, 1964). It might have been *E. distachya*, which is common in the Alps.



Plan of the coombes by Kerney *et al.* (1964), showing how the eroded chalk deposits (stippled areas) are distributed in two lobes across the valley below the NNR.

Kerney's report raises some interesting questions about the way chalk erodes, which could be useful knowledge when planning the management of the reserve. Is it really possible that there has been hardly any erosion for thousands of years? As far as I can make out, it seems to be true (see appendix 3.1). Although chalk is a soft rock, in comparison with some other geological layers, it is still a fairly tough material. Unlike limestone, it does not dissolve readily in rainwater to form caves. It is not necessarily the case that all plants growing on the Downs, even in exposed places, are exposed to very alkaline conditions. Chalk heath occurs when plants receive acid rainwater rather than calcareous ground water, and there are clear indications of this habitat on the slopes.

The first strictly ecological study of the Downs was published in 1973 by B.H. Green on the practical aspects of chalk grassland management. It is now a rare document and I have not seen a copy, but Rodwell (1991) describes the main findings. Green was concerned with the control of Tor Grass (*Brachypodium rupestre*), which had become problematic since the decline of rabbits in the 1950s. He found that once this grass had become dominant it was very difficult to control again. He considered that burning in early spring, followed by cattle and then sheep grazing, was the best way to produce a more diverse sward; he also recommended mowing with removal of the cuttings.

Another early study was by Ian Trueman, then a PhD student at the University of Liverpool, on milkworts, *Polygala*. He visited Wye Downs in 1968 and recorded *Polygala amarella* x *vulgaris* (= *P. xamara-vulgaris* Brögg)

in a 'sloping area of almost bare chalk in association with *P. vulgaris* and *P. amarella*' at Crown Field (TR072465) (Stace, 1975). This, and Ian's other observation from Magpie Bottom, are the only records of that hybrid in Britain and, although Stace originally reported that it was also known in Czechoslovakia, the latest edition of his book (Stace, Preston & Pearman, 2015) now says that there is no substantiated European record. The BSBI database lists Trueman's record as unconfirmed but it is accepted, with caveats, in the Hybrid Flora.

I asked Ian about this, and he replied: 'When I was looking at *Polygala* populations for my PhD, I visited two populations in Kent, one at Magpie Bottom, Shoreham TQ546608 and another on Wye Downs at TR072465. These have *Polygala vulgaris*, *P. calcarea*, *P. calcarea* x *vulgaris* and *P. amarella*. I scarcely did any collecting (*amarella* is rare) but I did also look at material collected by Barbara Pickersgill, both from those populations and from one other. I considered that there was a facies intermediate between *vulgaris* and *amarella* but this was merely based on morphology. The pollen seemed to be OK although there was reduced stainability.'

He continued: 'in my thesis (I still have a yellowing copy of it!) I said in the summary that it was not possible to conclusively differentiate between ecotypic differentiation and introgression in this case, so I was not particularly sure about it myself. The situation is confused in these populations because wherever you have *vulgaris* and *calcareoidea* together you get pretty sterile hybrids but also some population differentiation which looks like introgression. Throw *amarella* in the mixture, have very limited sampling, and the picture is pretty difficult to clarify!' (I.C. Trueman, pers. comm., 26/4/2020).

During the 1960s and '70s the warden, John Duffield, carefully compiled information on the history of the woods, which resulted in his report on vegetation changes in 1977, and he studied the ecology of the Late Spider Orchid, *Ophrys fuciflora*, the results of which were published in 1979.

On the subject of vegetation, Duffield's main findings were that the Downs were originally cleared of tree cover about 500 BCE and that there was essentially no woodland thereafter, until the 18<sup>th</sup> century. He also concluded that Beech, *Fagus sylvatica*, was not native on this part of the Downs.

On Spider Orchids, Duffield focused on protecting the plants from trampling and grazing, and he tried to facilitate reproduction by hand-pollinating plants (which was standard practice on nature reserves at that time). His conclusion was that as they are long-lived (some were believed to survive for 20 years) and could reproduce vegetatively, it did not particularly matter if the sward became dense. There was some conflicting evidence, however: after the colony at Bulltown Corner had been bulldozed, it not only recovered quickly but actually expanded into two populations; and after the drought of 1976 thinned the grassland, the decline in numbers was reversed.

Duffield's reports do not contain many records, but associated species are given for the *O. fuciflora* colonies in the Kneading Trough (C6), Aldglose Down (C24A) and what he called Newbarn Coombe (C24B, Bulltown Corner). His identifications seem reliable, although I have changed his *Ranunculus reptans* to *R. repens* on the assumption that it was a typo. Apart from the orchid counts, there are no dates on any of his records, so I have used 1970 as roughly the midpoint of his activity. Using that somewhat arbitrary date, Duffield's records add some 19 species to the site list, but they are common plants that just hadn't been written down previously.

During this time three people visited the NNR to record quadrats as part of the National Vegetation Classification project at Lancaster University (Rodwell, 1991-2000). The aim was to record standardised samples of vegetation throughout Britain and to use a computer to produce a systematic classification of all the different communities. Some 30,000 quadrats were compiled, of which 12 were at Wye and Winchcombe. These were made by Prof. C.D. Pigott (1928-2022) in 1968, Miss G.M. Fearn in 1973 and by Miss J.P. Huntley in 1977. Donald Pigott was the Director of the Cambridge Botanic Gardens, Gillian Fearn was a PhD student at Sheffield University (later a lecturer at Sheffield Hallam University), while Jacqueline Huntley is described as a research assistant on the NVC project (Rodwell, 1991), working mainly on the computer analysis. Their results are reproduced here in full in the section on vegetation, with the following corrections: *Carex ericetorum*, recorded by Fearn, is changed to *C. caryophyllea*; *Iris pseudacorus* and *Bromopsis ramosa*, by Huntley, are changed to *I. foetidissima* and *Brachypodium sylvaticum*. Huntley also recorded *Vicia sativa*, which I have excluded for now. On the NVC database, Fearn's quadrat is given the date of 1<sup>st</sup> November, which seems very

unlikely, and I have amended it to just the year, 1973. The NVC data is explored further in the section on vegetation.

The main activity on the NNR in the 1980s and '90s was a second study on *Ophrys fuciflora*, by D.A. Stone and R.V. Russell, who produced their report in 2000. They refuted Duffield's main conclusions, showing that although seed-set was very low, it was nevertheless the most important mechanism for recruitment of new plants. Although the orchid can increase slightly by forming new bulbs, this never leads to larger colonies in practice because the older bulbs die off as fast as the new ones are formed. They emphasised that bare ground is vital for the establishment of seedlings. Although their work seems very solid, Stone & Russell's report contains no biological records whatsoever – not even locations of the spider orchids, as that was deemed confidential. One mystery is that they identified six populations of *O. fuciflora* at Wye, and it is not clear how these relate to the four that are there now.

For over 100 years there was a college at Wye which lately specialised in agricultural science and countryside management. It was at the college that the idea of establishing a nature reserve on the Downs was first promoted. The college purchased Crown Field in the 1950s and undertook some experimental management to restore the grassland, including burning and grazing to reduce the dominance of *Brachypodium rupestre* (with some success, apparently). In 1992 one of the staff, Jonathan Mitchley (now at the University of Reading) recorded 26 small (50 cm square) quadrats in Crown Field, which are reproduced by Watt & Chapman (1994). Three of these were in a rather scrubby area and the rest in typical chalk grassland. These quadrats could be useful in determining the vegetation community (CG2/CG4, presumably) but are of limited use for monitoring, as no map is included. Many students at Wye also undertook their studies there. Most of these are now lost, but an exception is an MSc Dissertation by Caroline Ware in 1984, which provides a species list for the Devil's Kneading Trough. It has the unexpected inclusion of *Cerastium arvense* and *Vicia sativa*, which have not otherwise been found there, but despite that provides a useful list for the area.

To get comprehensive lists of the flora of the reserve, we have to turn to the BSB's Maps Scheme, in which the plants of each county have been plotted at steadily greater resolution since the Ordnance Survey's National Grid was established in the 1950s. The first such project was the Atlas of the British Flora (Perring & Walters, 1964), which mapped all plant species by 10 km square (hectad). That is a pretty crude unit of measurement, but even so there are a few records from this project which seem likely to relate to this part of the Downs. It was followed by two tetrad (2 km square) mapping projects led by Eric Philp in the 1970s (Philp, 1982) and 1990s (Philp, 2010). Although they are much smaller than hectads, a tetrad is still a huge area of countryside, and it is generally impossible to know whether a record relates to the NNR or not. For the purposes of this study, I have taken all of Philp's tetrad data and accepted for the reserve any species that has otherwise been recorded here, either before or since.

Since 2010 the scale has reduced further, with all records now being made at the 1 km square (monad) scale or finer. Even this, however, rarely allows us to say with confidence that a plant was seen within the reserve, and we must apply the same rule to the data. Unless a detailed grid reference is given (usually only for rarities), we still do not know which species are in the reserve. Fortunately, some members of the Kent Botanical Recording Group, notably Alfred Gay and Sue Buckingham, have made detailed records of some rare plants. Their records are the most significant contribution to our knowledge of Wye Downs since recording started, and it is difficult to find many species that they have missed.

#### [The current study](#)

For the current report I have visited the NNR many times since August 2019, recording all plants at least by compartment and generally with a precise 6- or 8-figure grid reference (100 m or 10 m square). I have also recorded numerous quadrats, localised by 8-figure grid references. Specimens and photographs have been collected as necessary to corroborate the records. Photographs given in this report are all of plants on the reserve unless clearly stated otherwise. They are included to provide evidence for the record and to act as an identification guide for surveyors visiting the site in future. Where specimens have been sent to referees, this information is also given. The aim is to provide as much certainty as possible about both the location and the identity of the plants recorded. The raw data is stored in the associated spreadsheet, a copy of which is held by the county recorder, Geoffrey Kitchener. It includes some records of casuals which I have not included in the



report as they add little to our understanding of the site, specifically: *Setaria pumila*, *Symphytum grandiflorum* and *Vicia faba*; and a number of species that seem to occur only along the verge of the Amage and Brabourne roads, not within the reserve (taking the middle of the hedge as the boundary), such as *Carex divulsa*.

Historical sources have been studied, and all records that seem to relate to the NNR or its immediate vicinity have been extracted. Assistance has been requested from anyone who seems likely to know the flora of the reserve, and several people have been kind enough to contribute their records and comments. These contributions are acknowledged in the appropriate places and of course all records are attributed to their owners in the spreadsheet.

## Species List

### Charophytes

*Chara globularis* Thuill., Fragile Stonewort: in cattle troughs at the bottom of Aldglose Down and Bulltown Corner (both C24, TR08424372 & TR08694363, 1/7/2020, conf. N.F. Stewart). These plastic containers are obviously not natural features, but the water in them is presumably from a local source, and therefore highly calcareous, showing what might happen if there was any open water on the site. Charophytes are generally viewed as axiophytes of unpolluted open water, and the presence of dragonfly exuviae in the water supports this.



### Bryophytes

There has not been a thorough bryological survey of the reserve, and there seems little reason to believe it is particularly rich for these plants, but some species are quite abundant in certain habitats and have been recorded as part of the vegetation surveys. Anything which is otherwise noteworthy is also included below.

*Radula complanata* (L.) Dum., Even Scalewort: on the bark of ash trees in Pickersdane Scrubs (J.M. & J.W. Bates, 2014).

*Frullania dilatata* (L.) Dum., Dilated Scalewort: on the bark of ash trees in Pickersdane Scrubs (Bates & Bates, 2014).

*Pellia endiviifolia* (Dicks.) Dum., Endive Pellia: abundant in the stream below the Kneading Trough (C9), where it appears to be the main tuft-forming plant.



*Metzgeria furcata* (L.) Dum., Forked Veilwort: on the bark of ash trees in Pickersdane Scrubs, C2 (Bates & Bates, 2014).

*Seligeria calycina* Mitt. ex Lindb., English Rock-bristle: in chalk grassland in the Kneading Trough, C6 (R.H. Carter, 2014). This is normally a woodland plant, largely confined to the SE of Britain, but it does sometimes occur in grassland.

*Ceratodon purpureus* (Hedw.) Brid., Redshank: in chalk grassland in C2 (Huntley, 1977) and C5 (Bates & Bates, 2014).

*Fissidens incurvus* Starke ex Roehl., Short-leaved Pocket-moss: in chalk grassland in the Kneading Trough, C6 (Bates & Bates, 2014).

*Fissidens taxifolius* Hedw., Common Pocket-moss: in ash woodland on Winchcombe Down (C25, Huntley, 1977) and grassland in the Kneading Trough, C6 (Bates & Bates, 2014).

*Fissidens dubius* P. Beauv., Rock Pocket-moss: recorded by Pigott in 1968 and by Fearn in 1973.

*Fissidens adianthoides* Hedw., Maidenhair Pocket-moss: in chalk grassland in the Kneading Trough, in C5 (Bates & Bates, 2014) and C6 (2014).

*Weissia controversa* Hedw., Green-tufted Stubble-moss: recorded in the Kneading Trough by Pigott (1968), Bates & Bates (2014) and Carter (2014). All records are for the subspecies *controversa*.

*Weissia angustifolia* (Baumgartner) D.A. Callaghan, Crisp Beardless-moss: in chalk grassland in the Kneading Trough, C6 (Bates & Bates, 2014).

*Trichostomum brachydontium* Bruch, Variable Crisp-moss: in chalk grassland in the Kneading Trough C6 (Bates & Bates, 2014 and Carter, 2014). This is a very westerly plant in Britain, and rare in Kent.

*Didymodon insulanus* (De Not.) M.O. Hill, Cylindric Beard-moss: in chalk grassland in the Kneading Trough, C5 (Bates & Bates, 2014).

*Funaria hygrometrica* Hedw., Common Cord-moss: in chalk grassland in the Kneading Trough, C6 (Bates & Bates, 2014). This plant often grows in places where there has been a fire.

*Bryum capillare* Hedw., Capillary Thread-moss: in chalk grassland in the Kneading Trough, C5 (Bates & Bates, 2014).

*Bryum argenteum* Hedw., Silver-moss: in chalk grassland in the Kneading Trough, C5 (Bates & Bates, 2014).

*Bryum dichotomum* Hedw., Bicoloured Bryum: in chalk grassland in the Kneading Trough, C5 (Bates & Bates, 2014).

*Bryum rubens* Mitt., Crimson-tuber Thread-moss: in chalk grassland in the Kneading Trough, C5 (Bates & Bates, 2014).

*Plagiomnium undulatum* (Hedw.) T.J. Kop., Hart's-tongue Thyme-moss: in Sycamore coppice at the top of Giddy Horn (C22).

*Lewinskya affinis* (Brid.) F. Lara, Garilleti & Goffinet: On the bark of ash trees in Pickersdane Scrubs, C2 (Bates & Bates, 2014).

*Neckera crispa* Hedw., Crisped Neckera: occasional in the chalk grassland. It is a strong indicator of calcareous conditions and could be treated as an axiophyte of the more species-rich habitats at Wye. It has been recorded several times since 1973 (Fearn).



*Neckera complanata* (Hedw.) Hüb., Flat Neckera: in chalk grassland in the Kneading Trough, C5 (Bates & Bates, 2014 and Carter, 2014).

*Thamnobryum alopecurum* (Hedw.) Gangulee, Fox-tail Feather-moss: on the woodland floor in Pickersdane Scrubs, C2 (Bates & Bates, 2014).

*Homalothecium lutescens* (Hedw.) H. Rob., Yellow Feather-moss: abundant on the chalk faces in the quarry at the Crown, C34 (S. Lemon, 2023), in the Kneading Trough, C6 (Carter, 2014) and (previously, perhaps) in Pickersdane Scrubs, C2 (Huntley, 1977). This is a characteristic species of chalk grassland. The photo below is by Stephen Lemon.



*Brachythecium rutabulum* (Hedw.) Bruch, Schimp. & W. Gümbel, Rough-stalked Feather-moss: abundant in the short grassland on the slopes (much less so amongst Tor Grass), especially in the winter. It was also recorded by Huntley in woodland quadrats in the 1970s. This is a very common moss which occurs in a wide variety of habitats.



*Pseudoscleropodium purum* (Hedw.) M. Fleisch, Neat Feather-moss: frequent in the grassland, becoming abundant in damp situation in light scrub, as shown here in the quarry at Crown Field. This is one of the commonest bryophytes of open situations. To confirm identification, check for a tiny, curved point at the tips of the leaves. It was recorded in CG2 grassland here by C.D. Pigott in 1968.

*Rhynchostegium megapolitanum* (Blandow ex F. Weber & D. Mohr) Schimp., Indian Feather-moss: in chalk grassland in the Kneading Trough, C5 (Bates & Bates, 2014 and Carter, 2014).

*Eurhynchium striatum* (Hedw.) Schimp., Common Striated Feather-moss: on the woodland floor in



Pickersdane Scrubs (C2) and chalk grassland in the Kneading Trough (C6) (Bates & Bates, 2014).

*Kindbergia praelonga* (Hedw.) Ochyra, Common Feather-moss: occasional throughout.

*Oxyrrhynchium hians* (Hedw.) Loeske, Swartz's Feather-moss: in grassland at the Crown, C34 (Fearn, 1973).

*Entodon concinnus* (De Not.) Paris, Montagne's Cylinder-moss: Wye Crown Pit (C34) (F. Rose, 1953). This is an axiophyte of sunny chalk grassland which can be expected to disappear if areas get scrubbed over.

*Hypnum cupressiforme* Hedw., Cypress-leaved Plait-moss: var. *cupressiforme* on ash trees in Pickersdane Scrubs, C2, and var. *lacunosum* in chalk grassland in the Devil's Kneading Trough, C6 (Bates & Bates, 2014).

*Ctenidium molluscum* (Hedw.) Mitt. Chalk Comb-moss: occasional in chalk grassland throughout.

## Vascular Plants

*Ophioglossum vulgatum* L., Adder's-tongue: in small areas of grassland on Aldglose Knoll (C21) and Denton's Field (C3); and reported at Quarry Spur (C18) by A. Gay in 2019. It is also in the meadow at the top of Winchcombe Down (C30), according to records by the Kent Field Club. This is an axiophyte of unimproved grassland which appears to be absent from the chalk grassland and restricted to the more mesotrophic meadows at the top and bottom of the escarpment.



*Equisetum arvense* L., Field Horsetail: in long grass by a hedge in the southern part of Denton's Field (C3) and frequent along the verges of Amage and Brabourne roads (both outside the NNR).

*Pteridium aquilinum* (L.) Kuhn, Bracken: abundant on Winchcombe Down, mostly in the woodland but also spreading some distance into the grassland at the top of the slope. There is also one isolated patch in some scrub in C29. On Wye Downs there are patches at the top of Quarry Coombe (C17) and Rattendane Coombe C23 (TR087439), and in the car park on the other side of Coldharbour Road.

*Asplenium scolopendrium* L., Hart's-tongue: scattered throughout the woods throughout and particularly abundant in the lower part of Newgate Scrubs (C13) and along the stream below the Kneading Trough (C9).

*Athyrium filix-femina* (L.) Roth, Lady Fern: in woodland at the top of Pickersdane Scrubs (C1) and in thick *Rubus fruticosus* scrub at the top of Newgate Scrubs (C13), TR082448. This is an axiophyte of acid, wet habitats and it only occurs at Wye in places where there is organic soil and/or clay overlying the chalk to create suitable conditions.

*Polystichum setiferum* (Forsk.) Moore ex Woynar, Soft Shield-fern: many plants on the north-facing slopes of Covert Wood (C17) and Giddy Horn (C22). It is quite a weak axiophyte of ancient woods on

calcareous soils, but here it seems to pick out the best stands of old woodland.

*Polystichum aculeatum* (L.) Roth, Hard Shield-fern: several plants along the sunken lane on Winchcombe Down (C25) and on north-facing slopes in Newgate Scrubs (C13); also an axiophyte of base-rich woodland.

*Dryopteris filix-mas* (L.) Schott, Common Male Fern: frequent in wooded areas, particularly on the slopes of Newgate Scrubs and Winchcombe Down.

*Dryopteris affinis* (Lowe) Fraser-Jenk., Golden-scaled Male-fern: in a few rather localised patches in woodland, at Pickersdane Scrubs (C1, C2), the top of Newgate Scrubs (C13) and, most abundantly, in north-facing woodland at the top of Cocklescombe (C17). This is a woodland axiophyte and a good indicator of the oldest, or best-preserved, stands of ancient woodland. The plants are ssp. *affinis*, with glossy leaves and densely scaly petioles.



*Dryopteris dilatata* (Hoffm.) A. Gray, Broad Buckler-fern: frequent in all wooded areas.

*Taxus baccata* L., Yew: scattered in all the woodland compartments, where there are some large old trees; most notably in C33, in Eggringe Wood. In the grassland areas it is much rarer because of grazing. Although it is notoriously poisonous to humans, it is palatable to livestock.

*Juniperus communis* L., Juniper: one plant about 1 m tall in an old quarry or earthwork at the bottom of compartment 10, TR07774505. It has obviously been planted there, but not in a surreptitious way. Juniper is normally considered an axiophyte of chalk grassland in southern England, where it is native. However, because it is such a rare plant it is often reintroduced or translocated as part of a Species Action Plan. We know that Juniper occurred at Wye Downs in the past, and it possibly persisted until the 19<sup>th</sup> century. Hanbury & Marshall (1899) describe it as common on the chalk Downs and give records

from the 1830s (H.B. Mackeson, 'turf downs above Brooke and Wye') and 1880s (W.R. Jeffrey, 'woods near Brooke', which make a pretty good description of our site. Furthermore, there is a dot for it in this part of the county (TR04) in Perring & Walter's Atlas of 1962, which should date from the 1930s or '40s. As Plantlife are the lead partner for this species under the Biodiversity Action Plan, I asked them if they knew anything about an introduction here, but they do not (Nicola Hutchinson, *pers. comm.*). Whether to leave it there or remove it is a matter of personal taste; it is unlikely to cause any harm.



*Helleborus foetidus* L., Stinking Hellebore: scattered plants in the lower parts of Newgate Scrubs (C13, TR077449 & TR078448), including some seedlings. There is apparently also one more plant in Pickersdane Scrubs (C2, TR075457, A. Jupp, 2019), but I have not seen it. This is an axiophyte of woodland edges and clearings on calcareous soils.



*Anemone nemorosa* L., Wood Anemone: occasional in wooded areas such as Pickersdane Scrubs (C2), Giddy Horn (C22) and Coombe Wood (C28), but only really abundant in the latter site. This is an axiophyte of ancient woodland, which seems resistant to deer grazing.

*Clematis vitalba* L., Traveller's Joy: scattered in grassland and scrub throughout. It particularly favours dry chalk soils and in places is abundant, even in the dense shade of the woodland in Newgate

Scrubs (C13), where it can be the only species in the shrub layer in the summer.

*Ranunculus acris* L., Meadow Buttercup: frequent in the more neutral grassland at the top and bottom of the escarpment, particularly in the pasture at the top of Winchcombe Down (C30).

*Ranunculus repens* L., Creeping Buttercup: occasional on the lower slopes of Wye Downs (C3, C24).

*Ranunculus bulbosus* L., Bulbous Buttercup: frequent in the grassland throughout, especially in the chalk grassland on the slopes.

*Ranunculus peltatus* Schrank, Pond Water-crowfoot: in two dewponds at the top of Winchcombe Down (C27 & C30), where it was first recorded by Alfred Gay and the Kent Field Club in 2014. This is an axiophyte of clean water ponds. Photo by A. Gay.



*Ficaria verna* Huds., Lesser Celandine: abundant in the wet woodland at the bottom of the Kneading Trough (C9) and frequent elsewhere, scattered in woodland and abundant in damp scrub and hedges. All plants appear to be *F. verna* ssp. *fertilis* (Lawalrée ex Laegaard) Stace, the form without 'bulbils' in the leaf axils.

*Aquilegia vulgaris* L., Columbine: abundant on the slopes of the Kneading Trough (C5, TR075451) in 2016, in an area temporarily cleared of scrub. It was also recorded here in Philp's first Atlas (1970s) but not in his second (1990s), so it seems to be sporadic in its appearance. This is considered a native species, but it is also widely grown in gardens, and it often escapes, so it is now impossible to know where it is wild.

*Ribes rubrum* L., Red Currant: occasional in woodland areas such as Pickersdane Scrubs (C2) and Giddy Horn (C22).

*Ribes uva-crispa* L., Gooseberry: a few bushes in scrub at the bottom of Giddy Horn (C18). This is a



garden plant which is sometimes established in the wild, usually in hedges.

*Chrysosplenium oppositifolium* L., Opposite-leaved Golden-saxifrage: abundant along the stream below the Kneading Trough (C9). This is an axiophyte of woodland flushes and stream sides.



*Hylotelephium telephium* (L.) H. Ohba, Orpine: one patch on the fence line at the top of Newgate Scrubs (C13), just below Wyncot Kennels. This is a plant of dry hedgebanks and rock outcrops which has become quite scarce in Kent.

†*Anthyllis vulneraria* L., Kidney Vetch: recorded at Wye Downs until 2012, Crown Field until 2013 and in the Winchcombe area until the 1990s, with no detailed locations given. This is an axiophyte of calcareous grassland.

*Lotus corniculatus* L., Common Bird's-foot-trefoil: frequent in the grassland throughout.

*Hippocrepis comosa* L., Horseshoe Vetch: locally abundant in species-rich grassland throughout. This is an axiophyte of calcareous grassland and appears to be a good indicator of the areas where there is a short, open sward of the *Festuca ovina* type of grassland. The place where it is most abundant is perhaps C32 on Winchcombe Down (TR086498), where it is frequent throughout the sward.



*Vicia cracca* L., Tufted Vetch: rare, in grassland in Denton's Field (C3).

*Vicia sepium* L., Bush Vetch: rare, in hedges and scrub.

*Lathyrus pratensis* L., Meadow Vetchling: occasional, in the neutral grassland at the bottom and top of the escarpment at Wye and Winchcombe.

*Ononis repens* L., Common Restharrow: occasional patches in grassland in places such as the millstone steps (C5), Broad Down (C10) and Aldglose Down (C24). This is an axiophyte of unimproved calcareous grassland.



*Medicago lupulina* L., Black Medick: frequent in the grassland throughout.

*Trifolium repens* L., White Clover: occasional in grassland, mainly in the more neutral swards on level ground.

*Trifolium campestre* Schreb., Hop Trefoil: rare, in eroded grassland around the Crown (C34).

*Trifolium dubium* Sibth., Lesser Trefoil: in bare, trampled grassland along the bottom of the Kneading Trough (C7) and around the Crown (C34).

*Trifolium pratense* L., Red Clover: frequent in the neutral grassland at the top and bottom of the slope; only rare on the slopes.

*Trifolium medium* L., Zigzag Clover: rare, in chalk grassland in the Kneading Trough (C5) and Crown Field (C34).

*Cytisus scoparius* (L.) Link, Broom: in grassland at the top of Winchcombe Down (C30).

*Polygala vulgaris* L., Common Milkwort: frequent in the chalk grassland throughout. In the 19<sup>th</sup> century E.S. Marshall and J.F. Duthie recorded in this area *Polygala oxyptera* Rchb., which they considered a more prostrate plant with white flowers; it is now considered to be within the natural variation of *P. vulgaris*.



[*Polygala amarella* x *vulgaris* = *P. x amara-vulgaris* Brögg, Common x Dwarf Milkwort: found at Crown Field (TR072465) by I.C. Trueman in 1968, with both parents, on a sloping patch of bare chalk. The record was based on morphological characters and, as this seems to be the only record of it anywhere in the world, it is considered only a tentative identification. It is, however, included in the BSBI's Hybrid Flora (Stace *et al.*, 2015). See the history chapter above for a full explanation.]

†*Polygala serpyllifolia* Hose, Heath Milkwort: recorded at 'Wye Downs' by J.F. Duthie in 1876 and by Francis Rose in 1943 'on a leached area of plateau.' This is an axiophyte of acid grassland and chalk heath.

[*Polygala calcarea* F.W. Schultz, Chalk Milkwort: in the vicinity of Crown Field (TR04T) in the 1990s, according to Philp's 2010 Atlas, but there are no precise details. It was apparently also seen by P.D. Stanley (who was looking for *P. amarella*) on Aldglose Down (C24, TR084437) in 1996, but he described it as abundant, which seems unlikely. It is an axiophyte of chalk grassland which has long been considered to be absent from this part of the Downs. The photograph below was taken by Malcolm Storey in Wiltshire.]



†*Polygala amarella* Crantz, Dwarf (Kentish) Milkwort: first recorded by J.F. Duthie in 1871, and subsequently seen by several very reputable botanists. It was apparently still fairly abundant at Crown Field (C35) in 1969 (I.C. Trueman), but there are no convincing records of it since then. It is an axiophyte of calcareous grassland, restricted to a few sites in Kent and the Pennines, and it is considered Nationally Rare and Endangered. The picture below was taken in the Pennines by Malcolm Storey.



*Prunus spinosa* L., Blackthorn: frequent in hedges and scrub.

*Prunus domestica* L., Wild Plum: rare, in hedges and scrub. There is a small thicket of plum trees on Winchcombe Down (C32).

*Prunus avium* (L.) L., Wild Cherry: several trees in open woodland in Newgate Scrubs (C13), at the bottom of the Kneading Trough (C5), on the top of Winchcombe Down (C25, C27 & C31) and in the quarry in Crown Field (C34).

*Sorbus aria* (L.) Crantz, Whitebeam: occasional in rather open woodland and scrub, notably in C17, C18, C20, C24, C34 and on Winchcombe Down. Some of the trees are quite old, notably the ones along the spine of the Quarry Spur (C18).

*Cotoneaster horizontalis* Decne, Wall Cotoneaster: well-established in the quarry in Crown Field (C34). This is a colonist of bare rock faces where it benefits from the lack of competition.



*Cotoneaster franchetii* Bois, Franchet's Cotoneaster: in grassland at the bottom of Pickersdane Scrubs (C2, TR074456). This species can be distinguished by the yellowish, tomentose lower sides to the leaves and the hairy calyx. It is a colonist of open ground and would be unlikely to persist in shady woodland.



*Crataegus monogyna* Jacq., Hawthorn: frequent throughout in hedges, woodland, scrub and grassland.

*Filipendula vulgaris* Moench, Dropwort: frequent in the grassland at Crown Field (C34), where it has been known since the 19<sup>th</sup> century (W.R. Jeffery & F.J. Hanbury), and in one place in the Kneading Trough (C6, TR077450, A. Gay, 2020).



*Rubus idaeus*, Raspberry: rare, in woodland in Pickersdane Scrubs (C1).

*Rubus phoenicolasius* Maxim., Japanese Wineberry: well-established in scrubby woodland at the top of Pickersdane Scrubs (C1, TR076456). This is a neophyte which is grown in gardens and occasionally becomes established in the wild. It would probably not thrive under a closed canopy, but at present the ash trees in this part of the wood have been thinned by Ash Dieback, and the scrub is thriving.



*Rubus fruticosus* L., Bramble: occasional to abundant throughout. Philp recorded the variety *ulmifolius* in the 1990s.

*Rubus caesius* L., Dewberry: occasional throughout. This is a widespread plant in Kent, most typical of calcareous grassland. It is abundant in places, and forms dense scrub on parts of Aldglose Down, C23 & C24), but is scattered throughout in grassland, scrub and woodland. To be confident of the identification, it is useful to find fruits with small numbers of drupes and a glaucous bloom, as in the photograph below). Other brambles with ternate leaves seem to lack the bloom and are probably hybrids (*R. fruticosus* agg. sect. *Corylifolii* Lindl.) but these microspecies have been ignored here.



*Potentilla anserina* L., Silverweed: abundant in places on the flat ground, either at the bottom or the top of the escarpment, most notably at the bottom of the Kneading Trough (C7).

*Potentilla* \**mixta* Nolte ex Rchb. (*anglica* x *reptans*), Hybrid Cinquefoil: in the meadow at the top of Winchcombe Down (C30, TR090498).

*Potentilla reptans* L., Creeping Cinquefoil: occasional in neutral grassland and scrub.

*Potentilla sterilis* (L.) Garcke, Barren Strawberry: occasional in woodland and scrub throughout.

*Fragaria vesca* L., Wild Strawberry: occasional along woodland paths and in scrub on the slopes.

*Geum urbanum* L., Wood Aven: frequent in woodland and scrub.

*Agrimonia eupatoria* L., Agrimony: scattered throughout the grassland.

*Poterium sanguisorba* L., Salad Burnet: frequent in the calcareous grassland on the slopes, but virtually absent from the more neutral grassland on the flat. This is an axiophyte of base-rich grassland.

*Aphanes arvensis* L., Parsley-piert: occasional on patches of bare ground at the top of the escarpment above the Kneading Trough (C4), at Crown Field (C34) and Winchcombe Down (C27). This is a winter annual, best recorded between December and April.

*Rosa arvensis* Hudson, Field Rose: occasional in the woodland throughout.

*Rosa canina* L., Dog Rose: scattered throughout, in grassland and scrub. The hips and pedicels are quite glabrous.



*Rosa x dumalis* Bechst. (*canina* x *caesia*), Hybrid Dog-rose: recorded in the vicinity of Wye (TR0745) by Kitchener in 2015.

*Rosa tomentosa* Sm., Harsh Downy-rose: recorded in the vicinity of Wye (TR0745) by Kitchener in 2015.

*Rosa micrantha* Borrer ex Smith, Small-flowered Sweet-briar: in grassland and scrub throughout; an axiophyte for this habitat. The hips and pedicels have reddish glandular hairs.



*Rhamnus cathartica* L., Buckthorn: frequent on dry, wooded slopes and in scrub throughout. It is an axiophyte of calcareous woodland, widely distributed on suitable soils throughout England and Wales, but seemingly declining quite significantly in Kent.



*Ulmus procera* Salisb., English Elm: in woodland at the top and the bottom of Newgate Scrubs (C13), where there are some fairly large trees as well as plenty of regrowth from suckers; also in the quarry in Crown Field (C34)

*Ulmus minor* Mill., Small-leaved Elm: in a hedge at the top of Newgate Scrubs (C13, TR081449), where some of the larger specimens are suffering from Dutch Elm Disease; and in woodland at the bottom of this compartment (TR076449), where there are some tall trees, 12 m or so high, which seem disease-free.

*Urtica dioica* L., Stinging Nettle: in scrub, woodland and enriched areas of grassland throughout.

*Fagus sylvatica* L., Beech: the most extensive stands are at Giddy Horn (C20) and Winchcombe Down (C28). In the former, the beech forms a rather open type of woodland or scrub with a scruffy ground flora of nettles and brambles, as if this was a grazed wood-pasture rather than an ancient wood. In Coombe Wood the beech is more a part of a typical ash wood canopy with the ground carpeted in bluebells or ramsons. There are also many beech trees planted along the verge of Coldharbour Lane and scattered throughout the site. Duffield (1977) studied the



woodland history in some detail and concluded that the beech trees were planted, and that no regeneration occurs, but there are certainly beech saplings in Pickersdane Scrubs.

*Castanea sativa* Miller, Sweet Chestnut: one tree in scrub between C29 and C32 on Winchcombe Down (TR088498), and several more on the edge of Eggringe Wood (C30).

*Quercus cerris* L., Turkey Oak: some large trees on the top edge of Newgate Scrubs (C13), the bottom of the Kneading Trough (C3) and on Winchcombe Down (C25), with saplings established in the grassland elsewhere. This Southern European species is well established in Britain and blends in well in woodlands, but it is thought to have a detrimental effect on the reproduction of the two native species of oak, through the action of the Knopper Gall wasp, *Andricus quercuscalicis*, for which it is a host.

*Quercus ilex* L., Holm Oak: I have seen saplings in dense *Brachypodium rupestre* grassland on Crown Field (C34, TR071464) and on Winchcombe Down (C29), but I have not noticed any mature trees to provide the seed source.

*Quercus robur* L., Pedunculate Oak: scattered trees in the woods and hedges throughout, although it is rarely the dominant canopy tree.

*Juglans regia* L., Walnut: a sapling on the edge of Fishponds Down (C14, TR080444).

*Betula pendula* Roth, Silver Birch: not common, but scattered throughout in suitable locations, such as in grassland in Denton's Field (C3), the Kneading Trough (C6) and Winchcombe Down (C32), and open woodland in Newgate Scrubs (C13).

*Carpinus betulus* L., Hornbeam: in the woodland at Winchcombe Down (C28 & C30), but at Wye Downs it is rare and only occurs along the top of C13 (TR086443) and Giddy Horn (C22). When part of a native woodland flora this species is considered an axiophyte, but I am not sure that applies at Wye.

*Corylus avellana* L., Hazel: abundant in several of the woods, mainly as neglected coppice; also in hedges and scrub throughout. This species forms a major part of the understorey of several of the woods and it is one of the first colonisers to spread into the grassland, presumably from nuts buried by squirrels. In some areas where it is abundant, it appears to have been planted in straight rows, but Alfred Gay suggests that this may have been caused by chance,

as the seedlings spread along the terracettes in the former grassland.

*Bryonia dioica* Jacq., White Bryony: occasional throughout, in scrub and rank grassland and, especially, in recently cleared areas such as Denton's Field (C3).

*Euonymus europaeus* L., Spindle: only abundant in the quarry at the bottom of Crown Field (C34) but scattered throughout in hedges and grassland.

*Oxalis acetosella* L., Wood-sorrel: in rather open scrub on the north-facing slope of Giddy Horn (C22, TR084441). This is a woodland axiophyte which is widespread throughout Kent, although it prefers soils that retain moisture all year round. It is rare at Wye, presumably because the ground is often parched in summer.



*Mercurialis perennis* L., Dog's Mercury: abundant in the woods throughout.

*Populus tremula* L., Aspen: along the top of Winchcombe Down (C30), where it is spreading into the grassland.

*Salix caprea* L., Goat Willow: occasional in woodland, scrub and old quarries.

*Viola odorata* L., Sweet Violet: rare in hedges, as by a gate in C3 (TR074452).

*Viola hirta* L., Hairy Violet: frequent in the chalk grassland and in open woodland. This is an axiophyte of unimproved grassland.



*Viola riviniana* Reichb., Common Dog-violet: frequent throughout, in woodland and grassland. This species appears to be rather more abundant than the following, which occurs in similar habitats.

*Viola reichenbachiana* Jordan ex Boreau, Early Dog-violet: occasional in the woodland and grassland.

*Linum catharticum* L., Fairy Flax: frequent in the chalk grassland throughout.

*Hypericum androsaemum* L., Tutsan: scattered in the woodland in Pickersdane Scrubs (C2 & C3), Newgate Scrubs (C13), Giddy Horn (C22) and elsewhere. Isolated shrubs are also found in bracken and tall herb, as at the top of Quarry Coombe (C17). A woodland plant which appears to be increasing in Kent. In 2016 Geoffrey Kitchener recorded a single plant of *H. androsaemum* x *hircinum* = *H. <sup>x</sup>inodorum* Mill., Tall Tutsan at the top of Covert Wood (C17, TR086443, G.D. Kitchener, 2016) but I have not seen it there.

*Hypericum perforatum* L., Perforate St John's-wort: frequent throughout, in grassland, scrub and open woodland.

*Hypericum hirsutum* L., Hairy St John's-wort: frequent in tall grassland, woodland and scrub.

*Geranium dissectum* L., Cut-leaved Crane's-bill: occasional in tall grassland and along paths.

*Geranium molle* L., Dove's-foot Crane's-bill: in grassland in C4, above the Kneading Trough.

*Geranium robertianum* L., Herb-robert: occasional in scrub and woodland edges throughout. This species is a great coloniser of ruderal habitats and is one of the few that thrives on the painted stones of the Crown.

*Circaea lutetiana* L., Enchanter's-nightshade: frequent in woodland and scrub throughout.

*Epilobium hirsutum* L., Great Willowherb: along the path through Pickersdane Scrubs (C1, C2) and in tall grassland around the edge of Denton's Field (C3).

*Epilobium parviflorum* Schreb., Hoary Willowherb: scattered in woodland throughout.

*Chamerion angustifolium* (L.) Holub, Rosebay Willowherb: in scrub and woodland at the top of Pickersdane Scrubs (C1, TR077456).

*Acer platanoides* L., Norway Maple: occasional in woodland in Pickersdane Scrubs (C2).

*Acer campestre* L., Field Maple: in woodland throughout, with some very large, old trees present.

*Acer pseudoplatanus* L., Sycamore: occasional throughout and abundant at the top of Rattendane Coombe (C22), where there is a dense stand of neglected sycamore coppice.

*Malva moschata* L., Musk-mallow: rare, in field margins at Fishponds Down (C14) and Fishpond Bottom (C16, TR084444).

*Malva sylvestris* L., Common Mallow: occasional along paths and on disturbed ground.

*Tilia platyphyllos* Scop., Large-leaved Lime: one old tree, formerly coppiced, in Covert Wood (C17, TR086444, A. Gay, 2014). It is situated in the area that has the best claim to being ancient woodland at Wye, but this species was often planted in the past as a landscape marker, and it is doubtful whether it is really native in Kent at all.



*Tilia x europaea* L., Lime: one tree in C18 (TR082443), close to an old trackway and presumably planted, although it seems to be quite old. It was spotted here recently by Alfred Gay, but there is also a tetrad dot for here in Philp's first Atlas, dating from the 1970s.

*Tilia cordata* Mill., Small-leaved Lime: two planted trees in the coach park at the top of C1.

*Daphne laureola* L., Spurge-laurel: occasional in the woodland in Pickersdane Scrubs (C2), Giddy Horn (C22) and under yews in Eggringe Wood (C33); an axiophyte of calcareous woodland which is quite widespread in Kent.

*Helianthemum nummularium* (L.) Miller, Common Rock-rose: frequent in the chalk grassland; an axiophyte of unimproved calcareous grassland.



*Reseda luteola* L., Weld: abundant on disturbed ground in Denton's Field (C3) and the quarry (C18) and occasional elsewhere, on paths or waste ground.

*Reseda lutea* L., Wild Mignonette: occasional in field margins and patches of bare ground, such as a recently-cleared area in Denton's Glade (C2) and by the millstone steps (C5).

*Cardamine pratensis* L., Cuckoo-flower: scattered in open woodland on the north-facing slopes of Giddy Horn (C22), amongst *Allium ursinum*.

†*Draba muralis* L., Wall Whitlowgrass: collected by W.H. Hammond in 1904 and found 'in great quantity in a wood clearing, Wye Downs,' in 1923 by Miss M. Cobbe. Calcareous woodland is typical habitat for this species, which has never otherwise been found in Kent. It probably a long-lost member of the characteristic flora of the Downs which can spring up when the seedbank is disturbed. The photographs below are of plants in Shropshire.



*Alliaria petiolata* (M. Bieb.) Cavara & Grande, Garlic Mustard: frequent in woods and hedges throughout.

*Viscum album* L., Mistletoe: occasional in scrub, mostly along the bottom of the slope, in C2, C3, C8, C19 & C20, except for one in C14 which is mid-slope at 120 m. Host plants include *Malus domestica*, *Acer campestre* and *Crataegus monogyna*. Mistletoe is quite rare in East Kent, preferring the more humid climate of the West Country, but it is abundant in the nearby parts of the Stour valley, mainly on poplar hedges. The apple tree pictured below in 2019 died soon afterwards, possibly as a result of the heavy infestation of *V. album*, which is an uncommon event.



*Persicaria maculosa* Gray, Redshank: by a woodland path on Winchcombe Down (C25).

*Persicaria hydropiper* (L.) Spach, Water-pepper: along woodland paths and in ponds and wet hollows at the top of Winchcombe Down (C25, C27 & C30).

*Polygonum aviculare* L., Knotgrass: rare, along paths such as the one from the Coach Park in C1 toward the Kneading Trough.

*Rumex acetosa* L., Common Sorrel: occasional in grassland at the top and bottom of the escarpment, occasionally extending onto the chalk.

*Rumex crispus* L., Curled Dock: occasional in areas of disturbed ground such as path sides in the neutral grassland.

*Rumex sanguineus* L., Wood Dock: frequent in the woods.

*Rumex obtusifolius* L., Broad-leaved Dock: occasional on disturbed ground in the neutral grassland.

*Arenaria serpyllifolia* L., Thyme-leaved Sandwort: on anthills in grassland on the plateau (C12), at Winchcombe (C29) and in short, trampled grassland around the Crown (C34).



*Moehringia trinervia* (L.) Clairv., Three-nerved Sandwort: occasional in the woods throughout.

*Stellaria media* (L.) Villars, Chickweed: rare, in grassland at the top of the escarpment at Crown Field (C34).

*Stellaria holostea* L., Greater Stitchwort: in woodland edge and hedges at the top of Winchcombe Down (C27, C31) and along the verge of the Brabourne Road (but outside the reserve).

*Stellaria graminea* L., Lesser Stitchwort: occasional in the neutral grassland at the top of the escarpment (C1, C4, C27).

*Cerastium fontanum* Baumg., Common Mouse-ear: occasional in grassland, woodland and scrub.

*Cerastium glomeratum* Thuill., Sticky Mouse-ear: in short grassland and along paths, mostly in the more neutral meadows at the top and bottom of the slope.

*Silene vulgaris* Garcke, Bladder Campion: a good-sized patch in chalk grassland on Aldglose Down (C24, TR084438); it is also frequent on road verges all around.

*Silene dioica* (L.) Clairv., Red Campion: occasional in woods and hedges throughout.

*Cornus sanguinea* L., Dogwood: frequent throughout in woodland, grassland, hedges and scrub.

*Cornus alba* L., White Dogwood: one planted specimen in the coach park (C1).

*Primula vulgaris* Hudson, Primrose: widespread in the woodland and, less commonly, in grassland.

*Primula* \**polyantha* Mill. (*vulgaris* x *veris*), False Oxlip: this is quite a common hybrid wherever the parents occur together. It was first recorded here (as *Primula elatior*) in 1842 by Freeman and I have seen it in C3, C11, C21 and C26, where it tends to occur close to the edge of woodland.



*Primula veris* L., Cowslip: frequent in the chalk grassland and occasionally in the woods.

*Lysimachia arvensis* (L.) U. Manns. & Anderb., Scarlet Pimpernel: rare, on an eroded path in Rattendane Coombe (C21).

†*Lysimachia minima* (L.) U. Manns & Anderb., Chaffweed: recorded only by Francis Rose in 1986 on 'Brook Hillock' (Aldglose Down, C24). It typically occurs in damp places along woodland and heathland paths, usually on sandy soils. Its presence hints at chalk heath, as it is normally a calcifuge.

†*Hypopitys monotropa* Crantz, Yellow Bird's-nest: recorded in the late 19<sup>th</sup> century by W.R. Jeffrey 'Under the beeches on the Wye hills,' which seems very likely to be a reference to our site. It has not been recorded in the vicinity since, although there is an undated, unlocalised dot for this hectad (10 km square) in Perring & Walters's Atlas, which should in theory date from the 1950s. This is a saprophytic plant of leaf litter, usually found in rather open or disturbed woodland.

*Sherardia arvensis* L., Field Madder: rare, in grassland on Winchcombe Down (C26), on disturbed ground around a gateway.

*Asperula cynanchica* L., Squinancywort: this is an axiophyte of chalk grassland, restricted to the more species-rich parts of the sward. In some places (e.g. Broad Down (C10), Aldglose Down (C24) and Winchcombe Down (C32) it is very abundant, whereas in the Devil's Kneading-trough (C5, C6) it is localised and absent from large areas. In Kent this species is largely confined to the Downs.



*Galium verum* L., Lady's Bedstraw: occasional in the chalk grassland. This species is deep-rooted and tolerant of very dry soils.

*Galium album* Mill., Hedge Bedstraw: occasional throughout in hedges and tall grassland at the top



and bottom of the escarpment, only occasionally found in the chalk grassland.

*Galium aparine* L., Cleavers: frequent in rank grassland, hedges and disturbed woodland.

†*Galium tricornutum* Dandy, Corn Cleavers: recorded by W.R. Jeffrey 'near Wye' in the late 19<sup>th</sup> century. It is described as occurring 'in fields and dry places, on and near the chalk,' so the location could easily have been within the reserve, or in similar habitat nearby.

*Cruciata laevipes* Opiz, Crosswort: frequent in the meadows at the top and the bottom of the reserve and in hedgerows throughout.

*Centaureum erythraea* Rafn., Common Centaury: scattered throughout the grassland and abundant in places. In 2018. Heather Silk reported that there is *C. pulchellum* (Sw.) Druce, Lesser Centaury, at Bulltown Corner (C24, TR084437), but I have not seen it there.

*Blackstonia perfoliata* (L.) Hudson, Yellow-wort: scattered throughout the chalk grassland; an axiophyte of grassland and other habitats on strongly calcareous soils.



*Gentianella amarella* (L.) Boerner, Autumn Gentian: an axiophyte of unimproved calcareous grassland and dunes. I have seen it in C6, C10 & C14 scattered throughout the sward, on a hillock in C21 where it is abundant, and just one plant in C18. It is usually in slightly eroded and species-rich areas, avoiding the densest *Brachypodium rupestre* stands. The plants at Wye are ssp. *amarella*, which is the more common subspecies. In 1984 Early Gentian, *Gentianella anglica* (Pugsley) E.F. Warb. (now known as *G. amarella* ssp. *anglica* (Pugsley) T.C.G. Rich & McVeigh), was recorded by Puckett in C5, but this identification was made on the basis of its flowering time (16<sup>th</sup> June) rather than by any features of the plant (John Puckett, *pers. comm.*). It was never found during subsequent searches. I asked Tim Rich about this, and he suggested that an autumn gentian which

had been damaged the previous year might well produce early flowers.



*Vinca major* L., Greater Periwinkle: escape from a garden at Fishponds Bottom into the edge of C14 & C16.

*Lithospermum officinale* L., Common Gromwell: occasional on bare patches of chalk in the grassland and scrub throughout. As a strong calcicole, this is considered an axiophyte although it does occur in hedges and on waste ground as well as in woodland clearings and grassland.

*Echium vulgare* L., Viper's Bugloss: scattered plants in the grassland throughout, particularly in quarries and on bare chalk in thin grassland. This is considered an axiophyte of calcareous grassland and beaches.



*Myosotis arvensis* (L.) Hill, Field Forget-me-not: along the path to the quarry in C18 and widely scattered on Winchcombe Down along paths and on disturbed ground.

*Myosotis ramosissima* Rochel, Early Forget-me-not: two plants in grassland near the top of the crown (C34) in 2013 (C. Osborne). This species is a calcifuge and possibly a member of the chalk heath community.

*Cynoglossum officinale* L., Hound's-tongue: an axiophyte of calcareous grassland and sand/gravel beaches. It is frequent to abundant throughout, especially in Newgate Scrubs (C13) and adjacent compartments. It is also frequent on Winchcombe Down. It is found as scattered plants in open grassland and sometimes in large quantities in light shade of scrub or in woodland clearings. Although this is a scarce plant, it is sometimes so abundant at Wye that it should be considered a pest. It is potentially toxic to livestock if eaten (although most animals avoid it) and its seeds can cause health problems such as irritation or reduce the value of sheep's fleeces.



*Convolvulus arvensis* L., Field Bindweed: occasional in grassland at the top and bottom of the escarpment, particularly at the top of Broad Down (C4).

*Cuscuta epithymum* (L.) L., Dodder: abundant in Denton's Glade at the bottom of Pickersdane Scrubs (C2, TR074456) and all through the grassland from Aldglose Knoll (C21) to Bulltown Corner (C24). This is a parasitic plant which is without roots and it has no leaves or chlorophyll, so it is entirely dependent upon its host for water and nutrients. In most accounts it is said to parasitise heather, thyme and gorse but I have not seen it on any of these at Wye. Instead, it seems to favour *Galium verum*, *Origanum vulgare* and *Odontites vernus*. It is found in herb-rich grassland or cleared woodland where these herbs grow abundantly. There are records of it at Wye dating back to the 1950s (Perring & Walters, 1962), and it has a very scattered distribution in Kent.



*Atropa belladonna* L., Deadly Nightshade: numerous clumps throughout Wye Downs, where it has been recorded often since 1842 (G. Freeman). However, it has only once been recorded at Winchcombe Down and not at all at Crown Field. It is found in scrub or on woodland edges in C5 and C16, and it appeared in some quantity in C3 in 2020 following scrub clearance. This is an axiophyte of unimproved grassland and open woodland on chalk. It is sometimes recorded in open grassland but is more likely to occur in semi-shade.



*Solanum dulcamara* L., Bittersweet: occasional throughout in woodland, hedges and scrub.

*Fraxinus excelsior* L., Ash: frequent throughout, as large old trees in the woods and hedges and as saplings in the scrub and grassland. Some of the trees, particularly on the higher slopes, have been struck by Ash Dieback (*Hymenoscyphus fraxineus* infection). Some of these have died completely, but there are also instances of trees recovering – at least for a time. The ones most affected seem to be the ones that are also most stressed by drought, as the lower slopes are less affected. Ash is a particularly important constituent of the main woodland type at this site – W8 *Fraxinus excelsior* woodland – and it is not known how this will be affected by any significant reduction of tree cover. The most similar tree in size and ecology is sycamore, and it is possible that this might come to dominate the woodlands. It would be useful to keep a close watch on the fate of the ash over the next decade or so.

*Ligustrum vulgare* L., Wild Privet: occasional in the scrub.

*Veronica officinalis* L., Heath Speedwell: in dry, chalky scrub at Newgate Scrubs (C13) and Giddy Horn (C22), and in grassland at the top of Winchcombe Down (C30). This is an axiophyte of acid, heathy soils, and part of the chalk heath community at Wye.

*Veronica montana* L., Wood Speedwell: locally abundant in the woods throughout; an axiophyte of ancient woodland.

*Veronica serpyllifolia* L., Thyme-leaved Speedwell: along paths in the grassland at the top of Winchcombe Down (C27).

*Veronica hederifolia* L., Ivy-leaved Speedwell: in woodland and scrub throughout.

*Veronica filiformis* Smith, Slender Speedwell: in grassland in C18 and C24 and on the verge of the lane up from Fishponds Farm. This non-native species has become widespread in lawns in Britain in recent decades but is less commonly found in semi-natural habitats.

*Veronica persica* Poiret, Common Field-speedwell: occasional, on disturbed ground.

*Veronica chamaedrys* L., Germander Speedwell: frequent throughout, in grassland and open woodland.

*Veronica arvensis* L., Wall Speedwell: occasional on patches of bare ground in grassland throughout.

*Plantago major* L., Greater Plantain: occasional, along paths and on bare ground.

*Plantago media* L., Hoary Plantain: scattered in the chalk grassland throughout. This is an axiophyte of unimproved calcareous grassland.

*Plantago lanceolata* L., Ribwort Plantain: frequent and abundant throughout.

*Callitriche stagnalis* Scop., Common Water-starwort: in the pond at the top of C27 (TR091495) in 2020.

*Verbascum thapsus* L., Great Mullein: occasional throughout but most abundant, perhaps, on patches of bare ground in Newgate Scrubs (C13).

*Scrophularia nodosa* L., Common Figwort: occasional in woodland, especially in Newgate Scrubs (C13).

*Scrophularia auriculata* L., Water Figwort: occasional in woodland at Newgate Scrubs (C13) where it grows in soil that is damp in the spring but astonishingly dry in the summer.

*Buddleja davidii* Franchet, Butterfly-bush: scattered in scrub throughout, such as by Millstone Steps (C5, TR075451) and an overgrown quarry at Giddy Horn (C22, TR082441).

*Stachys sylvatica* L., Hedge Woundwort: occasional in hedges and woodland edges.

*Ballota nigra* L., Black Horehound: rare, on road verges and by paths.

*Lamium album* L., White Dead-nettle: occasional in hedges throughout, most conspicuously, perhaps, around Fishponds Bottom.

*Lamiastrum galeobdolon* (L.) Ehrend. & Polatschek, Yellow Archangel: a woodland axiophyte, frequent in all the more mature woods. The variegated garden variety, *L. galeobdolon* ssp. *argentatum*, is present in the woodland at the top of Pickersdane Scrubs (C2, TR075457), by the roadside at the bottom of Newgate Scrubs (C13, TR076449), and in the quarry in Crown Field (C34).

*Lamium album* L., White Dead-nettle: occasional in hedges throughout, most conspicuously, perhaps, around Fishponds Bottom.

*Galeopsis tetrahit* L., Common Hemp-nettle: rare, by a woodland path on Winchcombe Down (C25).

*Teucrium scorodonia* L., Wood Sage: occasional in the woodland and scrub.

*Ajuga reptans* L., Bugle: abundant in scrub in C3 and elsewhere, and occasional in wet woodland by the stream in C9. This is a woodland plant, but it also thrives in open conditions and is sometimes found in open chalk grassland, as on Fishponds Down.

*Glechoma hederacea* L., Ground-ivy: frequent in woodland and scrub throughout; less common in more open grassland.

*Prunella vulgaris* L., Selfheal: occasional in grassland and scrub.

*Melissa officinalis* L., Balm: a few plants in the corner of a field in C14 (TR080445) and by the path across the top of Covert Wood (C18). Possibly a garden throw-out, but it seems well naturalised.

*Clinopodium ascendens* (Jord.) Samp., Common Calamint: several plants in an open patch of grassland or scrub on the south-facing slope on Giddy Horn (C22, TR084440). This species is a strong calcicole which, as it occurs on bare ground, is found in old arable fields and on waste ground as well as species-rich habitats such as this.

*Clinopodium vulgare* L., Wild Basil: occasional in grassland and scrub throughout. It seems particularly abundant on the lower slopes of Aldglose Down (C24).



*Origanum vulgare* L., Wild Marjoram: frequent in the grassland throughout, and in some places abundant in tall grassland and scrub. This is an axiophyte of calcareous grassland and it is considered particularly significant at Wye because it is the host for the Black-veined Moth. However, it is very abundant both here and at Winchcombe Down, so it seems unlikely to be a limiting factor in the survival of the moth. In some compartments many of the plants are infested with the gall-forming mite *Aceria origani*. There are hardly any records of this mite on the NBN Atlas, but that could be due to a lack of recording.



*Thymus pulegioides* L., Large Thyme: occasional in chalk grassland throughout. This species appears to be about equally abundant as *Thymus drucei*, in very similar habitat, and often growing together. The best feature for separating the two appears to be the stems of the flowering shoots, which are more-or-less square in cross section in *T. pulegioides* and have lines of hairs on all four corners. In a selection of plants collected on Aldglose Down (1/7/2020) these plants also had larger leaves (6.5-7.5 mm long x 3-4.5 mm wide) and more elongated, leafy racemes. It has been recorded here since the late 19<sup>th</sup> century (as *Thymus Chamaedrys* Fries., 'chalk hills near Coombe Farm, Wye,' by W.R. Jeffrey) and many times since then. This is an axiophyte of calcareous grassland.



*Thymus drucei* Ronniger, Wild Thyme: occasional in the chalk grassland throughout. This species is best separated from *T. pulegioides* by the structure of the stem of the flowering shoots, which is rounded with two short sides slightly concave, and hairs evenly distributed across the concave sides. The flowerheads are terminal and more compact, and the leaves are smaller (4-5 mm long x 2-3 mm wide) (and even smaller on the non-flowering shoots, which are absent from *T. pulegioides*). It has been recorded frequently since 1973 (G.M. Fearn) and appears to be in very similar habitat to the other species. It is considered an axiophyte of chalk grassland in Kent, although it is much more common than Large Thyme in Britain, especially in the north.





*Mentha aquatica* L., Water Mint: in damp grassland at the bottom of the Kneading Trough (C7) and at the bottom of Fishponds Down (C14).

*Mentha* <sup>\*</sup>*piperita* L. (*aquatica* x *spicata* L.), Peppermint: around the lower margins of Fishponds Down (C14).

*Euphrasia officinalis* L., Eyebright: frequent in the grassland throughout Wye and Winchcombe Downs; an axiophyte of species-rich grassland. For ordinary purposes it is best to consider all the eyebrights to be one species, but the following microspecies occur:

- *Euphrasia nemorosa* (Pers.) Wallr., Common Eyebright: this is generally a tall, branching plant with flowers above the 9<sup>th</sup> node. It is found mainly at the bottom of the slope, in the more neutral grassland.
- *Euphrasia pseudokernerii* Pugsley, Chalk Eyebright: very similar to *E. nemorosa*, but the first flower occurs above the 10<sup>th</sup> node and the flowers are larger (>7 mm); it is found mainly on the more calcareous soils on the escarpment. It is likely that intermediates ('hybrids') occur where the two varieties meet.



*Euphrasia pseudokernerii*

*Odontites vernus* (Bellardi) Dumort., Red Bartsia: frequent in the less calcareous grassland at the top and bottom of the escarpment.

*Rhinanthus minor* L., Yellow-rattle: in grassland in Denton's Field (C3). This is an axiophyte of species-rich grassland and, as a parasite, is considered useful in creating a more diverse sward by reducing the density of vigorous grasses. It is a surprisingly scarce plant in Kent, with a rather patchy distribution.

*Verbena officinalis* L., Vervain: occasional in patches of tall grass and scrub throughout.

*Ilex aquifolium* L., Holly: quite abundant on Winchcombe Down but less common at Wye Downs, where it has presumably been depleted from the

grassland compartments by grazing. There are some large shrubs (sometimes with spineless leaves) in the more wooded areas such as Newgate Scrubs (C13).

*Campanula rotundifolia* L., Harebell: frequent in all the grassland compartments, where it is widely scattered throughout the sward. It is considered an axiophyte of unimproved grassland. This species is scarce and declining in Kent.



*Campanula trachelium* L., Nettle-leaved Bellflower: occasional in open woodland and scrub areas such as Covert Wood (C18, TR085444) and Giddy Horn (C20, TR082441). It is an axiophyte of ancient woodland and scrub and in Kent is largely confined to the North Downs. It also occurs on the verge of Amage Road.



*Carlina vulgaris* L., Carlina Thistle: frequent in short grass and on eroded chalk banks; this is an axiophyte of calcareous grassland.



*Arctium lappa* L., Greater Burdock: rare, in scrub at the top of the Kneading Trough (C1, C5).

*Arctium minus* (Hill) Bernh., Lesser Burdock: occasional in woods and hedges.

*Carduus crispus* L., Watted Thistle: occasional throughout, in patches of scrub. The first record was by E.S. Marshall in 1899, as *C. crispus* var. *acanthoides*, which is no longer regarded as a separate variety. This is a plant of calcareous soils with a high nutrient content.

*Carduus nutans* L., Musk Thistle: occasional in scrub and on disturbed ground around the Kneading-trough (C5); this is an axiophyte of calcareous grassland which in Kent is largely confined to the North Downs and seems to be decreasing quite dramatically.



*Cirsium vulgare* (Savi) Ten., Spear Thistle: occasional throughout.

*Cirsium acaule* (L.) Scop., Dwarf Thistle: a characteristic species of chalk grassland and an axiophyte of unimproved, species-rich grassland. It is frequent in the *Festuca ovina* grassland throughout, but absent from the dense stands of *Brachypodium rupestre* and from any areas of scrub or woodland. In Kent it is largely restricted to the North Downs, where it is widespread.



*Cirsium palustre* (L.) Scop., Marsh Thistle: at the bottom of the Kneading Trough (C7) and at the northern end of the meadow at the top of Winchcombe Down (C30).

*Cirsium arvense* (L.) Scop., Creeping Thistle: common in the neutral grassland at the bottom and the top of the escarpment.

†*Onopordum acanthium* L., Cotton Thistle: a few plants appeared in C5 in 2015 after scrub clearance work. They were apparently eradicated shortly afterwards. This species is considered to be an archaeophyte – an ancient introduction that is associated with man-made habitats. It is also commonly grown in gardens.

*Centaurea scabiosa* L., Greater Knapweed: occasional in the chalk grassland throughout; an axiophyte of species-rich calcareous grassland.



*Centaurea nigra* L., Common Knapweed: in recent years British botanists have adopted the European classification, which effectively splits Black Knapweed into two taxa, *C. nigra* L., Common Knapweed, which tends to occur on damper, acid soils, and *C. debeauxii* Gren. & Godr., Chalk Knapweed, which is found on dry, chalk soils. The two hybridise freely and in Britain it is unusual to find a pure population of either, so one could make an argument that there is really only the one taxon in Britain. Some of the plants on the chalk slopes at Wye seem to fit fairly well into the *C. debeauxii* camp, with narrow phyllaries (the black scales on the flowerhead) and a barely swollen top to the peduncle (stem), whereas the plants at the bottom of the hill are closer to *C. nigra*. When surveying, it is easy to find specimens that could be either, so it is more practical to treat everything as one species, *Centaurea nigra* s.l.



*Centaurea debeauxii* (above) and *C. nigra* – best treated as a single species



*Lapsana communis* L., Nipplewort: occasional throughout, in tall grassland, hedges and woodland edges.

*Hypochaeris radicata* L., Cat's-ear: common in neutral grassland at the top and bottom of the escarpment.

*Scorzoneroideis autumnalis* (L.) Moench, Autumnal Hawkbit: rare, in the least calcareous areas of grassland and scrub, such as along the verge of Coldharbour Lane in C4.

*Leontodon hispidus* L., Rough Hawkbit: frequent in the calcareous grassland on the slopes.

*Leontodon saxatilis* Lam., Lesser Hawkbit: occasional in the grassland throughout.

*Picris hieracioides* L., Hawkweed Oxtongue: occasional in the calcareous grassland and scrub on the slopes.

*Helminthotheca echioides* (L.) Holub, Bristly Oxtongue: a plant of disturbed ground; scattered thinly throughout.

*Tragopogon pratensis* L., Goat's-beard: rare, but scattered in the grassland throughout.

*Sonchus arvensis* L., Perennial Sow-thistle: rare in tall grassland and scrub (C5, C24).

*Sonchus oleraceus* L., Smooth Sow-thistle: occasional on disturbed or recently cleared ground and track sides.

*Sonchus asper* (L.) Hill, Prickly Sow-thistle: occasional on disturbed or recently cleared ground and track sides.

*Mycelis muralis* (L.) Dumort., Wall Lettuce: occasional in woodland in Pickersdane Scrubs (C2), along the Chalky Lane (C13) and on Winchcombe Down (C25).

*Taraxacum officinale* Weber, Dandelion: frequent throughout. There are many microspecies (varieties) of dandelion, but it is a very specialised job to give a name to them and no-one has yet attempted them at Wye. They all have a rather similar ecology, though, and it hardly seems worthwhile. Dandelions are thinly scattered throughout all the habitats on the Downs, but only abundant on disturbed soils.

*Crepis biennis* L., Rough Hawk's-beard: on bare patches in chalk grassland on Fishponds Down (C14, TR081445) or growing much taller in field margins and scrub in Denton's Field (C3, TR074450). This is a scarce and declining plant in East Kent, where it is largely restricted to the North Downs but, being somewhat ruderal, it has spread in urban areas in recent decades and for this reason is not considered an axiophyte; but it is characteristic of a distinctive natural habitat and could be considered a noteworthy plant at Wye.



*Crepis capillaris* (L.) Wallr., Smooth Hawk's-beard: frequent in the neutral grassland at the top of the Kneading Trough (C4) and at the bottom of the slope, as at the bottom of Aldglose Down.

*Pilosella officinarum* F. Schultz & Schultz-Bip., Mouse-ear-hawkweed: abundant in the *Festuca ovina* grassland but absent from the dense *Brachypodium rupestre* swards and from areas of scrub.



*Gnaphalium uliginosum* L., Marsh Cudweed: rare, along a track at the top of Winchcombe Down (C30, 2021).

*Inula conyzae* (Griess.) Meikle, Ploughman's-spikenard: occasional on bare ground in woodland, scrub and grassland. It is frequent in Newgate Scrubs (C13) and around an old quarry at Giddy Horn (C20), and in Covert Wood (C17) it occurs in steep W8 *Fraxinus excelsior* woodland. This is an axiophyte of dry chalky soils.



*Pulicaria dysenterica* (L.) Bernh., Fleabane: occasional in damp grassland at the bottom of the coombes, for example in Denton's Glade (C2, C3) and the bottom of Newgate Scrubs (C13).

*Bellis perennis* L., Daisy: scattered thinly in the grassland throughout. Some of the chalk grassland plants are particularly small and have unusually large numbers of ray florets, but such variations are not given names.

*Artemisia vulgaris* L., Mugwort: abundant in the rough grassland at the top of the Kneading Trough (C6).

*Achillea millefolium* L., Yarrow: frequent in grassland, scrub and open patches in woodland throughout.

*Anthemis cotula* L., Stinking Chamomile: an arable weed which has declined considerably in recent years and is now considered something of an axiophyte for this habitat in Kent, although it is also an archaeophyte (ancient introduction) and does not have a habitat in wild habitats. It has been known along the path at the bottom of Aldglose Down (C24) since 2014 (A. Gay) and in 2020 it was abundant from there to Bulltown Corner.

*Leucanthemum vulgare* Lam., Oxeye Daisy: occasional (bust only as scattered plants) in the chalk grassland, especially around the Kneading Trough (C5, C6 and C10).

*Tripleurospermum inodorum* (L.) Schultz-Bip., Scentless Mayweed: on disturbed ground in the quarry (C18).

*Jacobaea vulgaris* Gaertn., Ragwort: scattered throughout, in grassland, scrub and dry woodland.

*Jacobaea erucifolia* (L.) P. Gaertn., B. Mey. & Scherb., Hoary Ragwort: occasional in tall grassland and scrub around the fields at the top and bottom of the slope, and abundant on waste ground in the quarry (C18).

*Eupatorium cannabinum* L., Hemp-agrimony: occasional in woodland and scrub throughout, but abundant in a tall herb community at the top of Quarry Coombe (C17 & C22), where it forms an impressively dense thicket in the summer months with bracken and male fern.

*Adoxa moschatellina* L., Moschatel: abundant throughout, particularly in the damp woodland toward the bottom of the coombes and along the verge of the Brabourne Road. This is an axiophyte of ancient woodland, still widespread in Kent but rarely as abundant as at Wye.



*Sambucus nigra* L., Elder: frequent throughout, in woodland, scrub and hedges.

*Viburnum opulus* L., Guelder-rose: in woodland at Pickersdane Scrubs (C2) and in a little quarry on Giddy Horn (C20, TR082441).

*Viburnum lantana* L., Wayfaring-tree: frequent throughout, where it is an early coloniser of open grassland and a regular component of scrub and hedges.

*Symphoricarpos albus* (L.) S.F. Blake, Snowberry: on the edge of Pickersdane Scrubs (C1) by Coldharbour Road.

*Lonicera periclymenum* L., Honeysuckle: occasional in the more neutral woodland towards to top and bottom of the escarpment, as in Pickersdane Scrubs (C2) and Eggringe Wood (C31).



*Dipsacus fullonum* L., Wild Teasel: in some of the fields along the bottom, notably Denton's Field (C3). It favours rather disturbed, often damp soils.

*Knautia arvensis* (L.) Coulter, Field Scabious: occasional in the chalk grassland, mainly at the bottom of the escarpment in C3, C8 and C24.



*Succisa pratensis* Moench, Devil's-bit Scabious: frequent in the grassland throughout, where it flowers late in the year, generally continuing into October. This species is considered an axiophyte because it is scarce and confined to species-rich habitats such as acid woodland rides, heathland and – as at Wye – chalk grassland. It is not common in Kent and shows a substantial decline.



*Scabiosa columbaria* L., Small Scabious: occasional in the grassland; an axiophyte of calcareous, species-rich grassland.



*Hedera helix* L., Ivy: frequent in the woods throughout.

*Hedera hibernica* (G. Kirchn.) Bean, Atlantic Ivy: in the woodland at the tip of Winchcombe Down (C25, TR091493). The leaves are larger and less deeply divided than those of *H. helix*, and the arrangement of hairs on the young stems is different. This species is often considered to be rather coastal in distribution, but it is widespread elsewhere.



*Chaerophyllum temulum* L., Rough Chervil: occasional in hedges.

*Anthriscus sylvestris* (L.) Hoffm., Cow Parsley: occasional in hedges and woodland margin at the bottom of the slope.

*Pimpinella saxifraga* L., Burnet-saxifrage: scattered throughout the grassland throughout; this is an axiophyte of species-rich calcareous grasslands.

*Helosciadium nodiflorum* (L.) W.D.J. Koch, Fool's Water-cress: abundant in the stream below the Kneading Trough (C9).

*Pastinaca sativa* L., Wild Parsnip: abundant along the bottom of the Kneading Trough (C7) and Fishpond Bottom (C1); scattered elsewhere in hedges and long grass.

*Heracleum sphondylium* L., Hogweed: occasional to abundant in rank grassland, hedges and scrub.

*Torilis japonica* (Houtt.) DC., Upright Hedge-parsley: frequent in field margins and hedgerows at the top and the bottom of the escarpment.

*Arum maculatum* L., Lords-and-ladies: frequent in woodland and scrub.

*Lemna minor* L., Common Duckweed: abundant in a cattle trough at the bottom of Fishponds Down (C14, TR081445). Water plants are surprisingly mobile and can colonise new and isolated waterbodies very quickly.

*Tamus communis* L., Black Bryony: occasional in woodland and scrub throughout.

*Paris quadrifolia* L., Herb Paris: one small patch of 40-50 plants near the path across the top of Covert Wood, ca. TR08534433. This is presumably where it has previously been recorded in both of Philp's Atlases (1970s and 1990s). Herb Paris is a good ancient woodland indicator which is often found in damp calcareous woodland (almost invariably W8). A quadrat recorded in this area (Q1223) shows that it is rather uniform W8d *Corylus avellana* coppice with a few standards of *Fraxinus excelsior* which are now mostly dead. The ground flora is about 50% Wild Garlic and 50% Dog's Mercury.



*Cephalanthera damasonium* (Mill.) Druce, White Helleborine: scattered in the woodland at the bottom of Newgate Scrubs (C13, TR076449) and beside the track to Cold Blow (C15, TR084446, A. Gay, 2013). I don't think it has ever been recorded at Winchcombe Down, although there are tetrad records for the vicinity in Philp's atlases (1982, 2010). The first record for Wye Down was in 1898 (L. Kitching, BIRM). This is an axiophyte of ancient woods, usually found under *Fagus sylvatica* but here it is under Elm (*Ulmus minor*) with neglected Hazel coppice.



†*Epipactis purpurata* Sm., Violet Helleborine: recorded 'in a field border at Wye Downs, TR083440,' by Francis Rose in 1956 (this would be Giddy Horn C20 or C21); but there are no records of it since then. It is known in other woods in the vicinity, outside the NNR.

*Epipactis helleborine* (L.) Crantz, Broad-leaved Helleborine: in the lower parts of Newgate Scrubs (C13, TR077449, S. Buckingham, 2012) and along Chalky Lane.

*Neottia ovata* (L.) Bluff & Fingerh., Common Twayblade: frequent throughout in woods, woodland edges and open grassland. It is perhaps most abundant in the quarry in crown Field (C34) and along the Chalky Lane. This is a common axiophyte of calcareous woodland.

*Spiranthes spiralis* (L.) Chevall, Autumn Lady's-tresses: only on Winchcombe Down, where it is widely scattered but nowhere abundant in the chalk grassland. It has been known here since at least 1955 ('Downs above Winchcombe Farm,' Jocelyn Brooke). It is an axiophyte of species-rich grassland which favours dry, calcareous soils and sand dunes. There is also a dot for it in Philp's first Atlas (1970s) in the vicinity of the NNR (TR045), which is possibly from John Duffield's assertion that it was at the head of the Kneading Trough (C6) in the past, but it is not known when this was or whether it has persisted.



*Herminium monorchis* L., Musk Orchid: there was a solitary plant in the Devil's Kneading Trough (C6) in 2021, down from 8 plants in 2008 (A. Gay). It has been known at Wye Downs since the 19<sup>th</sup> century (Mrs Benson, in Hanbury & Marshall, 1899) and possibly also at Winchcombe Down ('near Crundale,' E.S. Marshall, 1890). This is a rare and declining axiophyte of calcareous grassland, mainly found in old quarries and on bare ground on steep, eroded slopes.





*Platanthera chlorantha* (Custer) Rchb., Greater Butterfly-orchid: there is a good patch of about a dozen plants in scrub at Newgate Scrubs (C13), and it has been seen by Alfred Gay in the Kneading Trough (C6, 1 plant, 2014 & C11, 3 plants, 2013) and on Giddy Horn (C20, 5 spikes, 2013). It may have also been in Crown Field in the 1970s, according to Philp's Atlas.



*Gymnadenia conopsea* (L.) R. Br., Chalk Fragrant-orchid: abundant in the chalk grassland throughout. There are many plants scattered throughout the sward around the Devil's Kneading-trough (C5, C6 and C10) and a good number in Denton's Field (C3, TR073455) mainly concentrated in the orchid scrape. It is most common on Winchcombe Down, with hundreds of plants in C26 and C29 when the sward is left ungrazed in the spring. At Crown Field there is a small number of plants scattered throughout. It is an axiophyte of dry chalk grassland which is much more frequent in the species-rich *Festuca ovina* grassland, but also able to survive in the dense *Brachypodium rupestre* sward in places like the glade at Giddy Horn (C20).



†*Coeloglossum viride* (L.) Hartm., Frog Orchid: collected by G.E. Smith (as *Habenaria viridis*) at 'High Chalk, above Brooke, in Herb. Borrer' (Hanbury & Marshall, 1899). His notes go on to say 'on high, rather moist chalk turf, as at Stowting, Brook, etc.' (Geoffrey Kitchener, *pers. comm.*). The date of this could have been about 1830 but, as William Borrer's herbarium is at Kew, we should eventually get a precise date and possibly even other details. Frog Orchid is considered to have been extinct in Kent since the 1940s.

*Dactylorhiza fuchsii* (Druce) Soó, Common Spotted-orchid: occasional throughout both Wye and Winchcombe Downs, where it was first recorded by Mabel Cobbe in 1923 (previously it had been ignored as too common). It occurs in calcareous habitats such as species-rich grassland and on disturbed ground.

*Orchis mascula* (L.) L., Early-purple Orchid: frequent in the grassland in the Kneading Trough (C5 & C6) and Aldglose Down (C24) and rare on Winchcombe Down (C29). This is typically a woodland plant, but I have not seen it in any of the woods at Wye, only in the better stands of chalk grassland. It is considered an axiophyte of woodland which often persists in species-rich grassland.



*Orchis purpurea* Huds., Lady Orchid: currently occurs in three places: Denton's Field (C3, TR074451), where there were 17 flowering spikes in 2020 in sheltered woodland edge habitat; at the top of the Kneading Trough (C6, TR077450), where there were 9 on an



exposed hummock of chalk grassland; and Giddy Horn (C20, TR083441), where there were 13 in a woodland glade. In the past, small numbers have also been seen on the west side of the Kneading Trough (C5, TR075450, D. Johnston, 2010) and Covert Wood (C18, TR083444, S. Buckingham, 2013). This is often considered an axiophyte of W12 *Fagus sylvatica* woodland, but it thrives best in light shade in coppiced woods or scrub. At Wye it seems to occur in grassland and scrub. This is one of Britain's rarer orchids, being largely restricted to the North Downs in Kent. It has been recorded here since at least 1829 (G.E. Smith).



*Orchis anthropophora* (L.) All., Man Orchid: the main population is in Denton's Field (C3, TR073450), especially in the area where the topsoil was scraped off as an experiment in the 1990s. However, it also occurs in the undisturbed grassland elsewhere in this compartment and it has recently appeared in large numbers (25 spikes counted by A. Gay in 2020) in a nearby area of recently cleared scrub at the bottom of Pickersdane Scrubs (C2, TR074455). It also occurs in small numbers above the Kneading Trough (C5, TR076452), on Fishponds Down (C14, TR081446, A. Gay, 2014) and along a track at the top of Winchcombe Down (TR090493, W. Ridley, 2012). This is an axiophyte of chalk downland; it is particularly interesting to see how well it has responded to experimental management at this site.



*Neotinea ustulata* (L.) R.M. Bateman, Pridgeon & M.W. Chase, Burnt Orchid: very rare, possibly extinct

now. This uncommon orchid was present in several places on the downs, from the Crown to 'above Bulltown.' It was known until at least the 1980s in the Devil's Kneading Trough (C6, TR07804503) and it persisted at Crown Field (C34) until 2006. It had been recorded in the vicinity since 1829 (G.E. Smith) and it is an axiophyte of chalk grassland. The photograph below was taken in Wiltshire by Sharon Pilkington.



*Anacamptis pyramidalis* (L.) Rich., Pyramidal Orchid: frequent in grassland and open scrub throughout.

*Anacamptis morio* (L.) R.M. Bateman, Pridgeon & M.W. Chase, Green-winged Orchid: only at Crown Field, where it has always been rare. David Lang found four plants in 1960, and there was just one remaining in 2021 (A. Gay). This is a curious species to find in this type of sward, as it is usually restricted to MG5 *Festuca rubra* grassland; however Hanbury & Marshall (1899) described it as particularly common on the chalk, and it might once have been abundant in meadows on the Downs above the reserve. It is a grassland axiophyte.

*Ophrys insectifera* L., Fly Orchid: abundant (about 50 plants in 2020) in dry woodland at the bottom of Newgate Scrubs (C13, TR076449), rare in grassland in the Kneading Trough (C5, TR076451, A. Gay, 2020) and rare in woodland at Giddy Horn (C20, TR082441, A. Gay, 2019). In the past it also grew at Winchcombe Down (probably C32, TR087498), according to Francis Rose (1946) but there are no records of it there since the 1970s. It is often described as a plant of W12 *Fagus sylvatica* woodland in southern England, but here it occurs in W8. It is an axiophyte of damp calcareous woodland and base-rich mires.



†*Ophrys* *hybrida* Pokorny (*insectifera* x *sphegodes*), Fly x Early Spider Orchid, was discovered on the Wye Downs in 1905 by G. Richardson, G.W. Harris and H. Walker. This was the first record of it in Britain. It apparently persisted until at least 1919 (E.J. Bedford) and then was reported from Winchcombe Down (and possibly also from Olantigh) by Francis Rose in the 1950s. There have not been any reports of it since then, however, and it has never been found anywhere else in Britain.

*Ophrys sphegodes* Miller, Early Spider-orchid: this is one of Britain's rarest orchids, although it is abundant in some of its sites, notably at Swanage in Dorset and at Samphire Hoe near Folkestone. Numbers fluctuate quite widely: Alfred Gay counted 23 on Winchcombe Down in 2021 (a reduction from about 300 in 1983, according to Francis Rose) and there were just a couple in the Crown Field (C34). It is an axiophyte of chalk downland and it probably needs a closely grazed sward. Foley & Clarke (2005) report that it is adversely affected by cattle grazing in winter but helped by sheep grazing in summer.

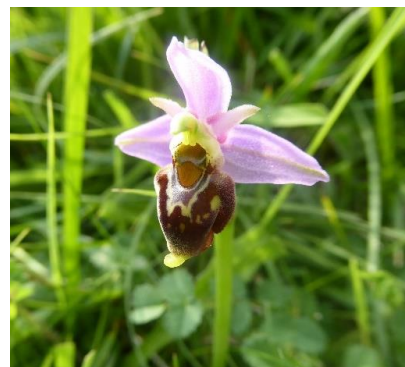


*Ophrys apifera* Huds., Bee Orchid: occasional in the grassland of the Devil's Kneading-trough (C5), Rattendane Coombe (C21), Aldglose Down (C24) and the Winchcombe Down (C26).

*Ophrys apifera* x *fuciflora* = *O. xalbertiana* E.G. Camus, Bee x Late Spider Orchid was found on Aldglose Knoll (C21) by Richard Bateman in 2004; Alfred Gay also photographed it here in 2014. Such hybrids can be hard to identify because Bee Orchid is such a variable plant. In this case it was identified by DNA studies.

*Ophrys fuciflora* (Crantz) Moench, Late Spider-orchid: there are four patches in the NNR, on Broad Down (C6) where there were as many as 10 plants in 2014; Fishponds Down (C14) where there were 16 plants in 2020, down from 21 plants in 2014; Aldglose Down (C24) where there can be as many as 58 plants (Gay, 2014) but only 14 in 2020; and Bulltown Corner (C24), for which there are records at least since the 1940s and in 2020 there were 18 plants.

Various studies have shown how difficult it is to manage for this species, which is nationally rare and on the edge of its range in Britain (although it is quite common on the continent, extending eastward to Asia Minor and the Levant). It is considered an axiophyte of CG2 *Festuca ovina* grassland and is a popular attraction for visitors.



*Iris foetidissima* L., Stinking Iris: in woodland and scrub throughout; abundant in some places, as on the lower slopes of Newgate Scrubs.

*Allium ursinum* L., Ramsons: abundant in woodland at Giddy Horn (C20, C22) and Covert Wood (C17, C18) and locally abundant elsewhere. It is characteristic of damp woodland, although it disappears completely by summer and often leaves the ground very bare. Ramsons is considered an axiophyte of damp, base-rich woods.

*Hyacinthoides non-scripta* (L.) Chouard ex Rothm., Bluebell: thinly scattered throughout the woods and the grassland. There are only a few places where it is abundant, as at the top of Winchcombe Down. It is interesting to find the patches of bluebell in open grassland, because this suggests that these areas



were formerly wooded. Although bluebell can persist for years or centuries in meadows, I have never heard of it spreading into them. This is considered an axiophyte in Kent despite being so widespread, because it is a good indicator of ancient woodland.



*Ruscus aculeatus* L., Butcher's-broom: rare in the wood at the top of Winchcombe Down (C25, TR091493). This is an axiophyte of ancient woodland on circumneutral soils.



*Juncus bufonius* L., Toad Rush: in ruts along a track at the top of Winchcombe Down (C30, TR090498).

*Juncus effusus* L., Soft-rush: in a pond at the top of Winchcombe Down (C30, TR089499).

*Luzula campestris* (L.) DC., Field Wood-rush: abundant in the grassland at the top of the escarpment throughout.

*Carex remota* L., Remote Sedge: numerous clumps along the edge of the stream below the Kneading Trough (C9).

*Carex hirta* L., Hairy Sedge: frequent in the sward along the bottom of the reserve (C19 & C21), where it was first recorded by Sue Buckingham in 2013, and along the verge of Brabourne Road (outside the NNR), where it has been known for many years.

*Carex pendula* Hudson, Pendulous Sedge: a few plants in Pickersdane Scrubs (C2) and one near a layby at Fishponds Bottom (TR08074448); presumably dumped here recently with garden

rubbish. Pendulous Sedge can be invasive in damp woodland and is known in sites nearby, but it has not been recorded in the NNR before now.

*Carex sylvatica* Hudson, Wood-sedge: occasional in woodland in Pickersdane Scrubs (C2), Coombe Wood (C25 & C28) and elsewhere. This is an axiophyte of ancient woods.

*Carex flacca* Schreb., Glaucous Sedge: abundant in the grassland throughout.

*Carex caryophyllea* Latour., Spring Sedge: occasional in the chalk grassland in the Kneading Trough (C5 & C6), Aldglose Down (C24) and Winchcombe Down (C26). This is an axiophyte of calcareous grassland.



*Miliun effusum* L., Wood Millet: in the Sycamore Copse at the top of Rattendane Coombe (C22); previously recorded by F.J. Hanbury in 1899. This is an axiophyte of ancient woodland.

*Schedonorus pratensis* (Huds.) P. Beauv., Meadow Fescue: in MG1 grassland at the bottom of the Kneading Trough (C7, TR076451).

*Schedonorus arundinaceus* (Schreb.) Dumort., Tall Fescue: occasional in the *Brachypodium rupestre* grassland on Broad Down (C4 & C10), in the clearing in Newgate Scrubs (C13) and on Aldglose Down (C24). It seems to be a rare component of the vegetation, with just the occasional flowerhead rising above the rest of the sward.

*Schedonorus giganteus* (L.) Holub, Giant Fescue: in a few places along woodland paths, such as the top of Pickersdane Scrubs (C1) and along Chalky Lane. It also occurs in hedges along Brabourne Road.

*Lolium perenne* L., Perennial Rye-grass: in grassland in the flat areas at the top and the bottom of the hills, notably C4, C12 and C21. This is probably the result of attempts at agricultural improvement some time ago, but it is doubtful that these areas were



ever ploughed and reseeded. In the more species-rich areas of grassland it is very rare or absent altogether.

*Festuca rubra* L., Red Fescue: occasional in the grassland throughout.

*Festuca ovina* L., Sheep's Fescue: occasional in the grassland. It is not always easy to tell Sheep's Fescue from Red Fescue, and I think they are probably both present in roughly equal amounts, but they are likely to be more common in different areas. Sheep's Fescue is often on ant hills and dry, eroded soils and is probably more closely associated with the orchid-rich areas. Some of the early descriptions of this site describe it as having a Sheep's Fescue vegetation, but it not entirely clear what that might be under the NVC.

*Cynosurus cristatus* L., Crested Dog's-tail: frequent in the grassland at the top of the Downs (C4 & C12) but only rare elsewhere and barely present at all on steep slopes.

*Briza media* L., Quaking-grass: scattered in the grassland throughout; an axiophyte

*Poa annua* L., Annual Meadow-grass: common on paths and patches of bare ground.

*Poa trivialis* L., Rough Meadow-grass: frequent in hedges and field margins; occasional in the woods.

*Poa pratensis* L., Smooth Meadow-grass: occasional in grassland throughout, and possibly in the woodland as well. Some recorders (e.g. G.D. Kitchener, 2010) have found Spreading Meadow-grass, *Poa humilis* Ehrh. ex Hoffm., but other people consider this no more than a subspecies.

*Poa compressa* L., Flattened Meadow-grass: occasional in the chalk grassland throughout, generally as scattered plants on patches of bare ground. This is an axiophyte of calcareous grassland, but it is more widely found on walls.



*Poa nemoralis* L., Wood Meadow-grass: common in the woods but difficult to identify until it sends up flowering culms, which it is shy to do in dense shade. There are many good clumps along Chalky Lane. This is a typical woodland plant which is widespread in Kent. It is surprising that it has not previously been recorded here.

*Dactylis glomerata* L., Cock's-foot: frequent in tall grassland and hedges.

*Catapodium rigidum* (L.) C.E. Hubb., Fern-grass: a couple of patches in rather bare chalk grassland in Denton's Field (C3, TR07394550) and in trampled grassland on the edge of the Crown (C34). It could be considered an axiophyte of this habitat, but it is also common by the sea and on roadsides and is therefore too widespread.

*Avenula pubescens* (Huds.) Dumort., Downy Oat-grass: this is one of the key axiophytes of chalk grassland and is the species that perhaps best represents the species-rich grassland at Wye. It is quite widespread on Wye Downs, Crown Field and Winchcombe Down – perhaps most abundant in the latter site.



*Avenula pratensis* (L.) Dumort., Meadow Oat-grass: rare, in chalk grassland above the Kneading Trough (C5, TR076452 & C6, TR07734509) and around the Crown Field (C34, TR071466). This is an axiophyte of chalk grassland, which in Kent it is rare and declining. This species reproduces mainly by seed, but the seeds are short-lived, so when it is outcompeted by tall grasses such as *Brachypodium rupestre* it disappears quite rapidly.

*Arrhenatherum elatius* (L.) P. Beauv., False Oat-grass: frequent in neutral grassland and scrub at the top and bottom of the escarpment, and occasional in the chalk grassland. This species often becomes abundant in unmown grass and the early stages of scrub formation, and it is ubiquitous in hedges.

*Trisetum flavescens* (L.) P. Beauv., Yellow Oat-grass: frequent in the grassland throughout.

*Koeleria macrantha* (Ledeb.) Schult., Crested Hair-grass: locally abundant in the grassland at Crown Field (C34) and above the Kneading Trough (C6, TR077450 & C10, TR077450). It is also present on Winchcombe Down (C26 & C29). This is an axiophyte of well-drained calcareous grassland and coastal dunes. It was first recorded by C.D. Pigott in 1968, and in 1977 J.P. Huntley listed it in three quadrats, which suggests that it was frequent at that time.



*Deschampsia cespitosa* (L.) P. Beauv., Tufted Hair-grass: one small patch by the path through Covert Wood (C18, TR083444) and a couple more in the pond at the top of Winchcombe Down (C30, TR089499).

*Holcus lanatus* L., Yorkshire-fog: frequent in the neutral grassland, scrub and open woodland, and occasional in the chalk grassland.

*Aira caryophyllea* L., Silver Hair-grass: a few patches in dry chalk-heath in the Crown Field (C34, S. Buckingham, 2022).

*Anthoxanthum odoratum* L., Sweet Vernal Grass: abundant in the sward at Crown Field (C34) and at the top of Winchcombe Down (C27 & C30); occasional in grassland and woodland elsewhere.

*Agrostis capillaris* L., Common Bent: abundant in the mesotrophic grassland at the top and bottom of the escarpment, especially at the top of Broad Down (C4) and Kennels Field (C12).

*Agrostis stolonifera* L., Creeping Bent: occasional in damp grassland, and also in some places which don't immediately appear damp, such as the bottom of the millstone steps (C5).

*Phleum pratense* L., Timothy: occasional in the semi-improved grassland at the bottom of the escarpment in Denton's Field (C3) and Rattendane Coombe (C21). This is a common agricultural grass.

*Phleum bertolonii* DC., Smaller Cat's-tail: occasional in the neutral grassland on the plateau.

*Glyceria declinata* Breb., Small Sweet-grass: in a pond at the top of Winchcombe Down (C30, TR089499) and possibly in other ponds and seasonally wet hollows nearby.

*Melica uniflora* Retz., Wood Melick: occasional in the woods, particularly along tracks and roadsides.

*Bromus racemosus* L., Smooth Brome: locally abundant in neutral grassland in Denton's Field (C3). This is a reasonably common grass of damp meadows and field margins.

*Bromus hordeaceus* L., Soft-brome: frequent in trampled turf around the Crown, and in field edges around the reserve, but surprisingly rare elsewhere.

*Anisantha sterilis* (L.) Nevski, Barren Brome: common on road verges and in hedgerows, but only occasionally in the open grassland.

*Bromopsis ramosa* (Huds.) Holub., Hairy Brome: in the hedge between C26 and C29 on Winchcombe Down; also along the Brabourne Road, but this is outside the reserve.

*Bromopsis erecta* (Huds.) Fourr., Upright Brome: frequent in the grassland on Winchcombe Down, especially towards the top of the slope in C27 (but not on the plateau) and at Crown Field. This is considered an axiophyte, although it can be a very invasive and dominant species, rather like *Brachypodium rupestre* (and often in the same places). It is strongly calcicolous and in Kent is largely restricted to the chalk.



*Brachypodium rupestre* (Host) Roem. & Schult., Tor-grass: abundant on the slopes at Wye and Winchcombe; in many places the dominant species in the sward, sometimes to the exclusion of almost everything else. It also forms scattered clumps in the more neutral grassland at the top and the bottom of

the reserve. This grass is often considered a problem species since the decline of rabbits in the countryside in the 1950s, with a tendency to dominate whenever grazing is reduced. It does not seem to persist for any length of time in woodland or scrub, however.

*Brachypodium sylvaticum* (Huds.) P. Beauv., False-brome: occasional throughout in hedges and woodland.

*Hordeum secalinum* Schreb., Meadow Barley: frequent in the grassland along the bottom of the escarpment, in Denton's Field (C3) and Rattendane Combe (C21, TR082439).

*Danthonia decumbens* (L.) DC., Heath-grass: rare, in species-rich grassland in the Kneading Trough (C5), at

Fishponds Down (C14) and Crown Field (C35). This is an axiophyte of the chalk heath community.



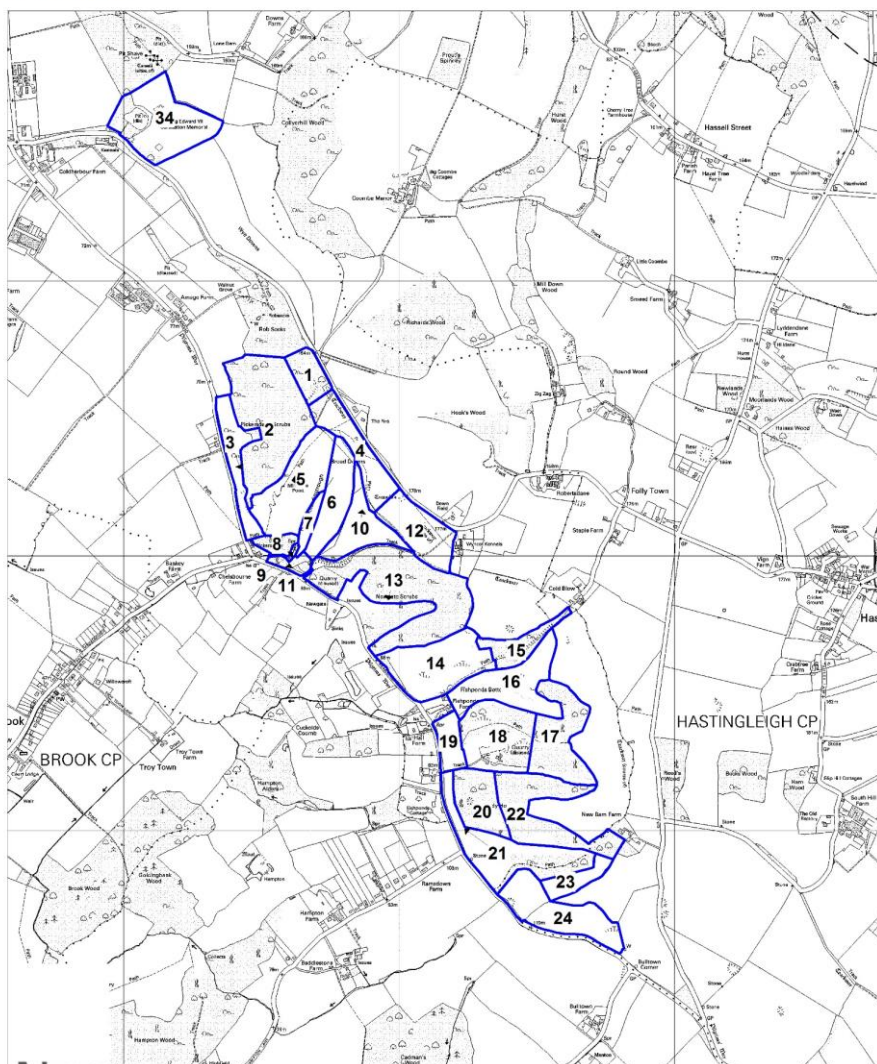


## Descriptions of the compartments



Wye NNR

Map 8a Management Compartments



Scale 1:20000

Map 1 of 2

0 400 800 1200m  
0 1000 2000 3000ft

Drawn by: Phil Williams  
Date: 21/01/2014  
Ref: tr07824531  
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Natural England  
International House  
Dover Place  
Ashford  
Kent  
TN23 1HU

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## Wye Downs

### Compartment 1

(5 axiophytes recorded here since 2010)

A small area of woodland and scrub at the top of Pickersdane Scrubs, and some clearings by the car park. There are some ancient woodland indicators such as *Dryopteris affinis* and *Neottia ovata*, and it is one of the few places where *Athyrium filix-femina* grows. Many of the larger ash trees seem to be suffering from Ash Dieback and there are several patches of non-native species, which is probably because of the proximity to the road. The understory is mostly hazel.

### Compartment 2, Pickersdane Scrubs and Denton's Glade

(10 axiophytes)

A large area of W8 woodland on quite steep slopes in two deep coombes. Some parts are coppiced hazel, others are more diverse high forest. This compartment is believed to have become wooded in the 18<sup>th</sup> century and by 1900 had as much tree cover as today (Duffield, 1977). It is mostly ash (much of which is suffering from dieback) with some stands of oak. On Natural England's habitat map the main stand of oak is shown as W10, but it is in fact just a variant of W8 with oak trees rather than ash in the canopy. If a large proportion of the ashes here die, then much of the woodland may become like this.



The lower part of this compartment includes some areas of grassland and scrub (Denton's Glade), where a good number of Man Orchids appeared in 2020 following scrub clearance work a year or so earlier.

There are numerous axiophytes in C2, including *Cuscuta epithymum*, which was abundant in the glade in 2020, and *Epipactis helleborine* in the woodland (rare or absent elsewhere).

In 1977 Jacqueline Huntley recorded a grassland quadrat which included *Koeleria macrantha*, *Avenula pratensis* and *A. pubescens*. I suspect this was made towards the bottom of compartment, in Denton's Glade. This area is now scrub which is periodically cleared by the management team, and there is no grassland of that quality there now.

### Compartment 3, Denton's Field

(19 axiophytes)

A strip of grassland and scrub along the bottom of the escarpment, parts of which are slightly less calcareous than on the slopes. There is abundant marjoram in the long grass, which is MG5 and CG2 going over to MG1 and W24 *Rubus fruticosus* scrub. This compartment has a small population (counts of half a dozen or so in a good year) of the black-veined moth. There was experiment in the 1990s, when a patch of ground was scraped to expose bare chalk. This scrape has been colonised by Man Orchid, *Orchis anthropophora* (which was the intention) and, until 2020, has been the best place for this species on the entire site. This raises the possibility of repeating the experiment and documenting the outcome, with a view to providing management





advice for this rare plant. (See appendix 3 for more details.) Other rarities in this compartment include *Orchis purpurea* in the grassland and *Atropa belladonna* on the woodland margin.

#### Compartment 4

(10 axiophytes)

The top of the slope above the Devil's Kneading Trough, between about 160 and 177 m OD, mostly on gentle slopes. Here there is loam and clay overlying the chalk, resulting in a more neutral sward dominated by *Agrostis capillaris*. It is shown as MG6 *Lolium perenne* grassland on the Natural England habitat map, but that does not seem to be right. (See the analysis in the vegetation chapter). This area has in the past been used for agriculture, and Kerney (1964) shows how there are lynchets around the edges created by ancient cultivation. It was also apparently reseeded in the 1950s. Since then, the sward has generally been closely grazed but in recent years this has been relaxed, and the species richness seems to have been increasing. Curiously, the overwhelming abundance of *Agrostis* in the upper parts almost suggests an upland community, but elsewhere it is clearly a form of MG5 *Festuca rubra* grassland with CG4 and CG2 in a narrow strip just above the Kneading Trough.



#### Compartment 5, Devil's Kneading Trough (west) & Millstone Steps

(38 axiophytes)

The southeast-facing slopes of the Devil's Kneading Trough. This includes a lot of good quality grassland in a matrix with scrub, and some neutral grassland at the top. Most of the grassland is, as elsewhere, dominated by *Brachypodium rupestre*, but along the Millstone Steps it has been held in check by trampling, and here there are fine grasses such as *Koeleria macrantha* and *Avenula pratensis*. The exposed, dry, south-facing slopes are ideal for creating patches of bare ground. It is the only grassland compartment with *Ophrys insectifera* (albeit just one plant in 2020) and it has some *Orchis anthropophora*.



#### Compartment 6, Devil's Kneading Trough (east)

(31 axiophytes)

This northwest-facing slope of the Devil's Kneading Trough is almost as rich as the opposite face. Mostly chalk grassland with some scrub invasion towards the southern end. There is an old quarry near the top, straddling the fence against C10, and the spoil heap from this quarry is where the *Ophrys fuciflora* colony occurs, as well



as various other rare plants such as *Orchis purpurea* and *Filipendula vulgaris*. On a lower slope there is one plant of *Herminium monorchis* (as of 2021).



### Compartment 7

(3 axiophytes)

The flat bottom of the Devil's Kneading Trough. The vegetation is scruffy, damp grassland of a neutral character. It is currently listed as MG6 *Cynosurus cristatus* grassland on the reserve map, but I think it is rather damp and overgrown for that; possibly a wet type of MG1. It does not look like it has been agriculturally improved.



C7



C9

### Compartment 8

A little patch of scrub with no axiophytes recorded.

### Compartment 9

(1 axiophyte)

A small, wooded compartment with a spring and stream running through it. The calcium-rich water gives rise to tufa deposits and there is an abundance of the liverwort *Pellia endiviifolia*, which facilitates the precipitation of calcium carbonate from the mineral-rich water. Otherwise, the flora of this compartment does not seem to be particularly remarkable, with rather ordinary W8 *Fraxinus excelsior* woodland and an abundance of Hart's-tongue Fern, *Asplenium scolopendrium*. The only axiophyte is *Chrysosplenium oppositifolium*. Springs at the base of chalk and limestone escarpments can be exceptionally rich habitats but at Wye the road along the bottom truncates the reserve in a most unfortunate place. This compartment is the only one with a tufa spring and It is a shame that it lacks any rarities; it might be better if it was grassland rather than woodland.

### Compartment 10, Broad Down

(19 axiophytes)

Spanning the ridge between the Kneading Trough and Newgate Scrubs, this compartment is almost entirely species-rich chalk grassland, with an abundance of *Asperula cynanchica*. It is not orchid-rich, but there is *Gentianella amarella* scattered throughout and it was the only location for *Neotinea ustulata* (which was lost in the 1980s). Someone has recently planted a juniper on the edge of an old quarry or earthwork in an inconspicuous corner of this compartment.

### Compartment 11

A small, wooded area by the road, with just 2 axiophytes recorded.

### Compartment 12

(7 axiophytes)

Like C4, a gently sloping field of grassland at the top of the escarpment with a loamy/clay soil over the underlying chalk. This parcel was reseeded in 1952 and is slowly reverting to species-rich neutral pasture.

### Compartment 13, Newgate Scrubs

(24 axiophytes)

A very steep compartment mostly covered with *Corylus avellana* scrub. Towards the top the woodland is more mature, with large old trees of *Acer campestre* and some *Fraxinus excelsior*, whereas towards the lower end there is a large glade of *Brachypodium rupestre* grassland. At the very bottom, adjacent to the road, there is elm woodland with large standards of *Ulmus minor* and *U. procera*. The ground flora is sparse throughout, as a result of intensive grazing by fallow deer, and there are very few tree seedlings or saplings to be seen. Only in the spring is the ground flora verdant, when it is dominated by unpalatable (to deer) *Allium ursinum*. There are badger setts in this wood, which adds to the disturbance of the ground layer.

Of particular note is a large population (50+ plants in a good year) of *Ophrys insectifera* in the lower part of the woodland, which are mixed with *Cephalanthera damasonium*, and there is a stand of *Platanthera chlorantha* in an area of scrub nearby. Patches of bare ground support numerous clumps of *Clinopodium ascendens* and in open woodland there are several plants of *Helleborus foetidus*. A 1722 map of C13 (see Duffield, 1977) shows this compartment as entirely open sheep pasture, but by 1840 about half the area was wooded.



### Compartment 14, Fishponds Down

(21 axiophytes)

Steeply sloping grassland with anthills, generally south-facing and very dry. One of the more orchid-rich areas, with a patch of *Ophrys fuciflora*. *Brachypodium rupestre* is not particularly dominant in the sward. Around the bottom of the slope there is tall, damp grassland and scattered scrub. At the top of the slope, bordering Newgate Scrubs, there is rather dry scrub.





## Compartment 15

(2 axiophytes)

A narrow, wooded area on both sides of a sunken trackway.

## Compartment 16, Fishpond Bottom

(2 axiophytes)

A forked valley with a broad, flat bottom. There is scrub around the margins with huge quantities of *Cynoglossum officinale* in some years, and some clumps of *Atropa belladonna*. The vegetation at the bottom is rather poor neutral grassland that shows some signs having been agriculturally improved in the past, but it is reverting to species-rich grassland.



C16



C17

## Compartment 17, Covert Wood and Quarry Coombe

(8 axiophytes)

At the bottom of C17, just above C16, the woodland has *Sorbus aria* and *Dryopteris affinis*. This is some of the more semi-natural woodland, on a north-facing slope. There is one old *Tilia platyphyllos* and numerous hornbeams, which helps make the case for this being an area of ancient woodland. The southern edge of this compartment is the top of Quarry Coombe, which is open *Allium ursinum* woodland in the spring but by summer is dense tall herb with bracken or male fern and hemp-agrimony forming an almost impenetrable thicket. Close to the path at the top of Covert Wood there is a patch of *Paris quadrifolia*, which is strong indicator of ancient woodland.

## Compartment 18, Covert Wood, Quarry Spur and Quarry Coombe

(3 axiophytes)

The large quarry on the south side of this ridge gives the compartment its name. There is a wide access track and an area of hardstanding in the coombe bottom which suggests there were buildings here in the past. The quarry itself has one of the most extensive areas of exposed chalk face, but although the flora is typical (it is a good place for eyebright) there appears to be nothing rare there. The woodland varies from rather open scrub with patches of grassland and tall herb, to closed canopy forest on the north-facing slopes.

## Compartment 19

Mostly neutral to slightly calcareous grassland, with just 2 axiophytes recorded to date.

## Compartment 20, Giddy Horn

(9 axiophytes)

This lower part of the Giddy Horn slope has a patch of mature *Fagus sylvatica*, Beech, in rather open scrub. The rest of the compartment is grassland, scrub and ash woodland. The vegetation community of beechwood somewhat uncertain: it could certainly be described as W12 *F. sylvatica* woodland if one focuses on the



canopy, but I am not convinced that this is a useful description. Beechwoods are supposed to be very shady, with a lot of leaf litter and not much ground flora in the summer months. The beech trees here seem planted and rather widely spaced to form a proper beechwood, and there is not much sign of regeneration.

The ground flora is very uniform on the plateau, being W8f *Allium ursinum* woodland here and on the north-facing slope. There are quite a few ancient woodland indicators, demonstrating that it is at least long-established. Towards the south side there is an extensive glade, which is mostly rather dreary *Brachypodium rupestre* grassland.

#### Compartment 21, Rattendane Coombe and Aldglose Knoll (8 axiophytes)

The extensive flat areas in this compartment appear to be semi-improved grassland which is actually rather species-rich in general. There is abundant *Hordeum secalinum* and Yorkshire-fog, with *Ranunculus bulbosus* and patches of *Carex hirta* in the sward. In places there are more MG5 grassland species such as orchids and knapweed, which may be spreading from the species-rich sward on the knoll.

Toward the top of the coombe there are more woodland plants. The steep hawthorn scrub on the south (north-facing) side of the coombe is very dry and in places rather closely grazed by deer and rabbits but also has several ancient woodland indicators.



The most valuable part of this compartment is Aldglose Knoll, which is the lower part of the ridge to the south of the coombe, where the grassland is unimproved and is rich in species such as *Ophioglossum vulgatum*, *Cuscuta epithymum* and *Gentianella amarella*.

#### Compartment 22, Giddy Horn (15 axiophytes)

The upper parts of Giddy Horn are also rather open, scrubby woodland with some mature whitebeams. At the very top of C22 there is some overgrown sycamore coppice. The north side of this compartment, where it descends into the coombe between Giddy Horn and Covert Wood, is mature woodland.

On the south side of this ridge is a small area of grassland which has not scrubbed over. It is very steep and there are patches of bare chalk on the slopes and terracettes.

#### Compartment 23

Mostly dense *Brachypodium rupestre* grassland with a patch of bracken at the top; no axiophytes currently recorded.

#### Compartment 24, Aldglose Down and Bulltown Corner (24 axiophytes)

This compartment contains some areas of very good quality grassland. Aldglose Down (C24A) is the hill at the north end, at the top of which there is an old quarry or excavation of some sort. Originally there was a larger mound, sometimes described as a barrow, but it was apparently bulldozed by the farmer in the middle of the 20<sup>th</sup> century. This contains a population of *Ophrys fuciflora*, together with other species of orchids. In the 1970s, Duffield considered this area to be too disturbed to bother with, but it could be the original location for *O. fuciflora* that was discovered in the 19<sup>th</sup> century.

The southern part of this compartment (C24B), which gets called Bulltown Corner (although that is actually the nearby road junction), was called Newbarn Coombe by Duffield (but not by Kerney, who gave that name to Rattendane Coombe). It certainly appears to be a natural coombe, with a similar origin to the other ones, although it is much smaller. It is on the north side of this coombe (best called Bulltown Coombe, perhaps) that the other colony of *O. fuciflora* occurs, close to an old chalk quarry.

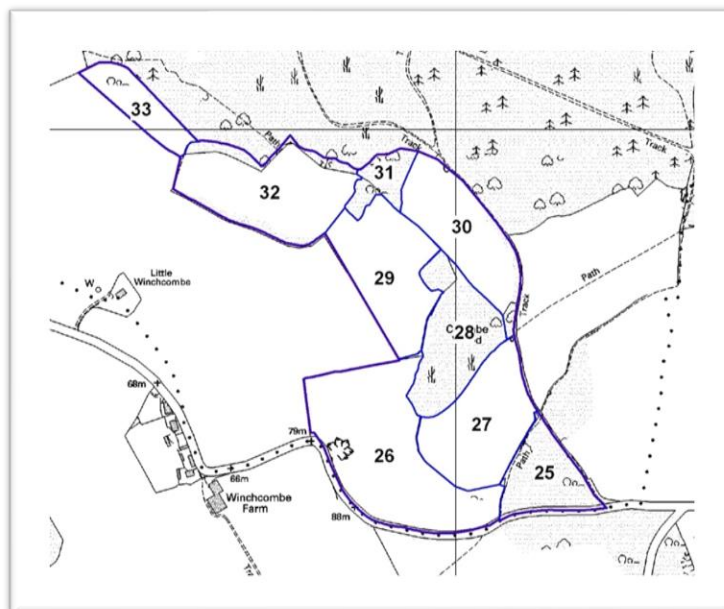
The grassland on Aldglose Down and in Bulltown Corner is very rich, with many axiophytes. *Cuscuta epithymum* is abundant all over Aldglose Down. The rest of the compartment is mostly scrub, from large patches of brambles (much of which is *Rubus caesius*) to stands of dense blackthorn. There is no open water, but two cattle troughs have been there for many years and these contain two species of charophyte as well as the larvae of dragonflies.



There is a track that leads along the bottom of this compartment which has an interesting range of weeds of disturbed ground, including huge quantities of *Anthemis cotula*, *Carduus crispus* and *Echium vulgare*.

## Winchcombe Down

This part of the reserve is not open to the public, although there is a footpath running along the top of the escarpment. It is managed in the traditional agricultural manner, with fairly intensive grazing in the grassland compartments by cattle. As a result, it is much more uniform in habitat than the Wye Downs, being almost entirely CG2/CG4 grassland in the fields on the slope (C26, C29 & C32), neutral MG5/MG6 grassland on the plateau (C26 & C30) and W8 woodland in the other compartments. There are some hedgerows and patches of scrub on the boundaries which approximately conform to W8.



### Compartment 25

(2 axiophytes)

A small area of woodland at the top of Winchcombe Down, mostly old, coppiced hazel with standards. There is quite a lot of yew and holly in this wood, suggesting that it has not been grazed, but there are signs of pheasant rearing, which is often considered to have a negative impact on the ground flora. On the whole, however, this is a small area of good quality ancient woodland.

### Compartment 26

(20 axiophytes)

Most of this compartment is fairly steep chalk grassland, with some small areas of scrub and some more ruderal habitat in old chalk pits. The sward is dominated by *Brachypodium rupestre* with frequent *Bromopsis erecta* and *Avenula pubescens*, especially towards the top of the slope. It is very good quality grassland, albeit somewhat swamped with Tor Grass in places. This is the compartment where most of the *Ophrys sphegodes* occurs.

### Compartment 27

(7 axiophytes)

Mostly a flat area of semi-improved neutral grassland with abundant *Anthoxanthum odoratum* and *Luzula campestris* in an *Agrostis capillaris* sward. There is a pond in the NE corner of the compartment, with *Glyceria declinata* and *Callitriche stagnalis*. On the slopes above C26 there is a transformation to chalk grassland, with *Bromopsis erecta* and *Brachypodium rupestre*.



### Compartment 28, Coombe Wood

(9 axiophytes)

Deciduous woodland grading into scrub at the edges. This is a fine stand of ancient woodland with a ground flora dominated by bluebells and wild garlic. Towards the top of the wood the trees are mainly *Fagus sylvatica* and *Carpinus betulus*, which may have been planted. Lower down there is more scrubby woodland.

### Compartment 29

(19 axiophytes)

Very rich chalk grassland with patches of *Koeleria macrantha* amongst a sward of *Avenula pubescens* and *Brachypodium rupestre*. In places

### Compartment 30

(8 axiophytes)

A neutral meadow at the top of the escarpment, with impeded drainage due to the cap of clay over the chalk. There is a pond on the edge of Eggringe Wood and wetland plants in ruts and hollows throughout, including *Juncus bufonius* and *Cirsium palustre* in their only locations in the NNR. There are also patches of *Helianthemum nummularium* and *Brachypodium rupestre*, which show some similarity with the chalk grassland on the slope. It is not entirely obvious how much this grassland has been improved agriculturally, or whether the *Agrostis capillaris*-dominated sward is the natural vegetation here. There are numerous waxcap fungi scattered throughout, and apparently patches of *Ophioglossum vulgatum*, both of which are indicators of unimproved grassland.



C30



C31

### Compartment 31, Eggringe Wood

A small area of scrubby woodland with a ground flora rich in bluebells. It is effectively an extension of Eggringe Wood and the top part is fenced off from the rest of the reserve. No axiophytes currently recorded.

## Compartment 32

(7 axiophytes)

Chalk grassland of high quality, with abundant *Hippocrepis comosa* and *Helianthemum nummularium*.



## Compartment 33, Eggringe Wood

(2 axiophytes)

A narrow strip of woodland on the edge of Eggringe Wood, shown on the OS map as rough grassland, but it has obviously been wooded for quite some time. There are some huge beech trees and a number of large yews, which may be hundreds of years old.

## Compartment 34, Crown Field

(40 axiophytes)

Some of the best chalk grassland in the county. It is part of the NNR but is owned by Imperial College, which acquired it as part of the Wye College estate. Management has apparently been minimal lately, leading to a deterioration in quality but there are still some rare plants here in abundance, such as *Filipendula vulgaris*. Until about 2010 the sward was closely cropped, but since then it has become tussocky and dominated by Tor Grass.

Some compilers of data have in the past used Crown Field as the default grid reference for the Wye Downs area, so it is likely that historical records overestimate what was actually in this field. The large sheep pastures immediately south of the Crown Field are outside the NNR and of less interest, despite appearing superficially like unimproved grassland. However, in 2021 they were left ungrazed during the spring, and some patches of previously un-noticed species rich grassland appeared.

The sward at Crown Field is mostly quite rank *Brachypodium rupestre* grassland on the slopes and something more neutral at the top. It has scattered clumps of bluebells throughout, indicating that it was once wooded, but bluebells can survive for many years (centuries) in unimproved grassland. At the lower part of the field there is a quarry with some bare chalk on the faces and scrub in the bottom.

The crown itself is not bare chalk, as might be expected, but painted stones enclosed in wire mesh. It therefore has no ecological interest except that it is surrounded by short turf where trampling by visitors has prevented the encroachment of tor grass. This trampled sward is particularly species-rich and contains species such as *Ophrys sphegodes*, *Koeleria macrantha* and *Avenula pratensis*.



## Ecology and Conservation

The origin of the landscape at Wye Downs dates from the end of the last Ice Age, about 15,000 years ago. Although this part of Britain was not heavily glaciated, it would have been very cold, and the habitat would at first have been tundra. Around the end of the Younger Dryas (11,000 – 10,000 years BCE), the coombes were formed by ice shattering the rock, carving steep valleys into the escarpment (Kerney, 1963). This would presumably have left bare rock faces of chalk and piles of chalk debris in the valleys, ready for colonisation by plants as the climate warmed.

It seems likely that at this time the surrounding countryside would have supported large herds of herbivores such as aurochs, elk and (at first, possibly) mammoth and bison, which would have wandered across from the continent. In the severe climate, they would have maintained a form of upland grassland for some time. The Stone Age people living in Britain at this time were hunter/gatherers and eventually, after the land bridge had disappeared under rising sea levels, they hunted the megafauna to extinction.

In the absence of large herbivores and in an improving climate, woodland spread across the landscape. This is traditionally known as the wildwood, and it is believed to have extended across much of the British Isles from about 6,000 years BCE. A study of pollen deposits around the South Downs (Waller & Hamilton, 2000) identified a spike in *Tilia* (Lime) pollen about 4,500 BCE. This may have been the peak time for closed woodland cover.

Around 4,000 BCE the 'Beaker People' arrived in Britain, bringing with them settled farming technology in the form of cultivation of cereals and beans, which had arisen in the Middle East about 10,000 BCE. The Beakers did not have livestock, but they would have cleared the better-quality land for agriculture. At Wye this might have been the plateau of the Downs. It seems unlikely that the steep slopes would have been much use to them, and the valley may have been too wet.

It was somewhat later that the Bronze Age Celts displaced the Beakers, starting in about 1,500 BCE. They were herders, bringing livestock (cattle, initially) over from France on boats. At this time, the lactose tolerance gene spread throughout the population, demonstrating the importance and extent of pastoralism. They could use the lower-quality land as pasture, and it is believed that the Downs were more-or-less deforested by 500 BCE, although some pockets of woodland may have been retained. None of those is likely to have been within the NNR although, given the number of ancient woodland species present, there is good reason to suppose that hedges and copses persisted in certain places, and the regeneration of the woodland has spread from these corners.

The Romans, Saxons and Normans continued the land management of the Celts, bringing sheep, hares and rabbits with them. This led to increasingly heavy grazing for a period of about 2,000 years. Eventually, the value of wool from the British countryside began to diminish, and some of the short grassland was left to revert to scrub and woodland. From about 300 years ago, this woodland has expanded to cover about a quarter of the reserve and, to judge from the amount of scrub in some compartments, the proportion continues to increase. At the same time, the existing trees are maturing, and the quality of the woodland improves. Meanwhile, the grassland has deteriorated in quality as it becomes increasingly dominated by Tor Grass since the relaxation of sheep grazing and the reduction in the number of rabbits following the myxomatosis outbreak in the 1950s.

Wye Downs has therefore always existed in a balance between grassland, scrub and woodland, and it is human activity that has been the determining factor in this relationship for thousands of years. For the site manager, it is useful to consider the relative value of these habitats, the species that inhabit them, and the practicality of maintaining each of them.

### Vegetation

There are three main vegetation types in the NNR: grassland, scrub and woodland, and the ecology and management of the reserve is entirely dominated by the relationship between these three.



Various authors have described the current vegetation of the reserve. The SSSI is designated for its chalk grassland, neutral grassland, scrub and woodland habitats, with three types of grassland (*Brachypodium rupestre*, *Festuca rubra* and *Bromopsis erecta*) and three woodland (*Fagus sylvatica*, *Fraxinus excelsior* and *Quercus robur*) communities. The scrub communities are left slightly vague.

The current management plan (Griffin, 2019) lists various NVC communities, based upon surveys undertaken by Natural England and the Joint Nature Conservation Committee over the years. The chalk grassland is described as CG4 *Brachypodium rupestre*<sup>1</sup> and CG5 *Bromopsis erecta* with small areas of CG2 *Festuca ovina*, while the neutral grassland is MG5 *Festuca rubra*, MG6 *Lolium perenne* and MG1 *Arrhenatherum elatius*. The woodland is listed as being W8 *Fraxinus excelsior*, W10 *Quercus robur*, W12 *Fagus sylvatica* (including some W12c *Taxus baccata*) and W14 *F. sylvatica*, while the scrub is W21 *Crataegus monogyna*.

This gives us quite a large number of vegetation types to examine, possibly as many as twelve NVC communities. However, it does not include any wetland, of which there are small patches at the bottom of the Kneading Trough and the top of Winchcombe Down. It does not seem to encompass the full range of scrub communities and there may even be a chalk heath community which has been overlooked. The aim of this analysis, therefore, is to attempt to determine which communities are present in the NNR, which are the most and least desirable, and how they change from one to another under the influence of management.

### Historical surveys

The most significant historical information we have come from the National Vegetation Classification database, which contains 12 quadrats recorded by C.D. Pigott in 1968, G.M. Fearn in 1973, and J.P. Huntley in 1977. Their data is given in appendix 1 (NB, I have renumbered the quadrats arbitrarily whilst compiling them).

#### NVC Quadrats recorded at Wye Downs NNR by Pigott, Huntley & Fearn

Quadrat Site	Comp.	GR	Date	Recorder	Community
Q1082 Kneading Trough	5	TR075452	03 JUN 1977	Huntley, Ms J.P.	CG4a <i>Brachypodium rupestre</i>
Q1083 Denton's Field	3	TR074453	03 JUN 1977	Huntley, Ms J.P.	W21d <i>Viburnum lantana</i>
Q1084 Denton's Glade	2	TR075455	03 JUN 1977	Huntley, Ms J.P.	CG2a <i>Asperula cynanchica</i>
Q1085 Kneading Trough	4	TR078455	03 JUN 1977	Huntley, Ms J.P.	CG4a <i>Brachypodium rupestre</i>
Q1087 Fishponds Down	14	TR082446	03 JUN 1977	Huntley, Ms J.P.	CG4a <i>Brachypodium rupestre</i>
Q1089 Fishponds Down	14	TR081446	03 JUN 1977	Huntley, Ms J.P.	W21d <i>Viburnum lantana</i>
Q1091 Kneading Trough	5	TR077454	03 JUN 1977	Huntley, Ms J.P.	CG4a <i>Brachypodium rupestre</i>
Q1100 Wye Downs	N/A	TR0745	01 JUL 1968	Pigott, Prof C.D.	CG2a <i>Asperula cynanchica</i>
Q1103 Wye Downs	N/A	TR0746	01 JUL 1968	Pigott, Prof C.D.	CG2a <i>Asperula cynanchica</i>
Q1120 Coombe Wood	25	TR091493	02 JUN 1977	Huntley, Ms J.P.	W8d <i>Fraxinus excelsior</i>
Q1121 Coombe Wood	25	TR091493	02 JUN 1977	Huntley, Ms J.P.	W8d <i>Fraxinus excelsior</i>
Q1147 Crown Field	35	TR071465	1973	Fearn, Dr G.M.	CG2a <i>Asperula cynanchica</i>

Looking in more detail at the data, we can see that 8 were in grassland and 4 in woodland. Analysing the quadrats individually using MAVIS (CEH, 2016) gives the results above, where 4 of the grassland quadrats are CG4 and 3 are CG2. The 4 all have quite large amounts of *Brachypodium rupestre*, which is of course strongly indicative of CG4, and a rather low species diversity, which confirms it. However, analysis of these 4 quadrats in MAVIS produces only a moderately good fit, with 57% correspondence. It is actually beaten by CG3 *Bromopsis erecta*, which is obviously incorrect because that grass isn't present in these samples; but it is an interesting result because that community is also overwhelmingly dominated by one species, also as a result of under-grazing, and both these communities occur on similar soils. Taking CG4 as the correct answer, the best match is given as CG4a *Avenula pratensis-Thymus praecox* (= *T. drucei*) subcommunity, and I suspect that these quadrats account for the dot for this square for CG4a in the NVC book.

The other 4 grassland samples come out as CG2a *Festuca ovina* grassland; *Cirsium acaule-Asperula cynanchica* subcommunity, which is the most typical, species-rich type of chalk grassland in the south (and the only one recorded in Kent). Analysis of the four quadrats together gets a very good fit, with a 70% correspondence

<sup>1</sup> In this report I have used simplified names for the NVC communities, based on the standard codes (W1, etc) together with the name of an appropriate species to indicate the typical community in this site. The official names are too long and often misleading, whereas the codes alone are difficult to visualise.

(which is what one would expect as they are the very quadrats on which the community description depends). They are noticeably more species-rich than the CG4 quadrats and Q1084 does not even have *Brachypodium* in it. This seems to confirm that there was plenty of CG2a *Asperula cynanchica* grassland at Wye in the 1960s and 1970s.

Two of the woodland quadrats, Q1083 & Q1089, were clearly recorded in scrub vegetation, as they have no dominant trees. Analysing the two quadrats together gives a reasonable fit to W21d, the *Viburnum lantana* subcommunity of *Crataegus monogyna* scrub. This seems very likely for Wye, where Wayfaring Tree is a common colonist of the grassland.

Of the 2 remaining woodland plots, one was in an oak wood and the other beech, but analysis suggests that they are both W8d *Fraxinus excelsior* woodland, *Hedera helix* subcommunity. When analysed on its own, Huntley's Beechwood sample (Q1121) gives a 46% match to W8 *F. excelsior* and only 38% to W12 *F. sylvatica*, so it is difficult to conclude from this data that there is any natural beechwood here.

#### The current survey

For the current survey I have recorded many quadrats in a variety of habitats throughout the site. These largely support the results of the NVC surveys, but there are some questions to be addressed.

Identifying the correct grassland community is something that could potentially help with monitoring the reserve. On the face of it, swards with only small amounts of *Brachypodium rupestre* (Domin score of 5 or less, i.e., under 25%) and a high species-richness (especially of calcicoles) should be CG2ai *Festuca ovina* – *Avenula pratensis* grassland, *Cirsium acaule* – *Asperula cynanchica* subcommunity, typical variant and, indeed, samples that match that description do come out as that whether keyed out or computed using MAVIS.

At the other end of the scale, quadrats with a high proportion of *B. rupestre* and low species diversity are easily identified as CG4a *Brachypodium rupestre* grassland. In theory, one could simply record plots on the grassland, 2 m x 2 m square, and calculate the proportion of 'good' CG2 and 'poor' CG4 by measuring the Tor Grass alone.

It becomes more difficult, however, when plots have a high proportion of *B. rupestre* and a high species diversity, as they often do. In an analysis of 22 grassland quadrats, I could detect no clear dividing line between CG2 and CG4, or even the CG5 *Bromopsis erecta* grassland at Winchcombe. Identification of the samples individually, using MAVIS, gave answers that were not supported by Twinspan analysis, and submitting the Twinspan groups to MAVIS gave the same result to all the end groups: CG2. The problem is that the species composition of these three communities is almost exactly the same. CG4 and CG5 are essentially just subsets of the CG2 species list, with increasing proportions of Tor Grass and Upright Brome, respectively.

It is therefore very difficult to assign any particular grassland area to an NVC community, and so this is not a technique that can easily be used for monitoring. It also makes it difficult to decide how to colour in the map. Wye Downs could be described as being all CG2 or all CG4, or a mixture of the two. Winchcombe could be described as a patchwork of CG2, CG4 and CG5, but the line between these communities would be arbitrary. The situation would be a lot simpler if we followed the early phytosociologists like Arthur Tansley, who simply referred to all chalk and limestone grassland as 'natural pasture.' This would be CG2 in modern parlance, with *Brachypodium rupestre*- and *Bromopsis erecta*-dominated stands as subcommunities.

In contrast to the above, the NVC analysis brings clarity when applied to the other communities studied. I can find no sign of W10, W12 or W14 woodland. Every woodland plot I have studied comes out unambiguously as W8d *Fraxinus excelsior*-*Acer campestre*-*Mercurialis perennis* woodland; *Hedera helix* subcommunity. This is the variety of W8 that is most associated with disturbed or secondary woodland, which corresponds well with what we know about the recent origins of this vegetation. It is slightly surprising that none of it is W8f *Allium ursinum* subcommunity but that is a westerly type of vegetation and the typical associates are not present.

The few quadrats that I recorded in scrub support Huntley's result of W21d *Crataegus monogyna*; *Viburnum lantana* community, which is the most calcicolous of the possibilities. This is a habitat worthy of further study,

and there are several species such as *Rhamnus cathartica*, *Euonymus europaeus*, *Clinopodium ascendens* and *Viscum album* which are associated with it. There is also some W24 *Rubus fruticosus* scrub.

At the top and bottom of the escarpment the sward tends towards the mesotrophic MG5 *Festuca rubra* grassland. This can be distinguished most easily by the loss of *Poterium sanguisorba* and various other calcicoles, and the arrival of *Ophioglossum vulgatum* and *Rhinanthus minor*. In places this is displaced by MG6 *Lolium perenne* grassland owing to earlier attempts at agricultural improvement but, on the whole, this is now reverting to species-rich MG5.

The other grassland community is MG1 *Arrhenatherum elatius*, which is what occurs around the edges of the compartments and wherever scrub is beginning to develop. There are unusual forms in the field adjacent to the coach park in C1 (which is dominated by docks, *Rumex* spp.) and at the bottom of the Kneading Trough, where there is abundant *Mentha aquatica*; but wherever the grassland is dominated by tall herbs, this is always MG1.

The following successional processes are seen in the grassland at Wye:

CG2 → MG1 (→ W24) → W21d → W8d

↕ pH ↕

(MG6) → MG5 → MG1 → W24 → W8d

The rare species at Wye occur primarily in two of these communities, CG2 and W8, but it is possible that MG5 could also develop to contain more unusual plants. The other vegetation types contain a smattering of rarities, both botanical and zoological. Conserving individual species, whether they are orchids or moths, is all about maintaining the right habitat for them. Usually (but not always), continuity is also very important.



## Changes in the flora

The number of species lost from the vicinity of the NNR is not great – around a dozen or so, over the last 150 years. Some of these are woodland plants or were recorded in the woods. Not much can be read into the disappearance of *Hypopitys monotropa* (in 1899), *Pimpinella major* (1899) or *Draba muralis* (1923). *Epipactis purpurata* (1956) is a more significant loss, but it seems that there might have been just one plant which did not survive in unsuitable habitat in a field corner. Overall, therefore, there do not seem to be any real losses from the woodland. The disappearance of *Galium tricornutum* (1899) similarly tells us little about the site: it is an arable weed that has been almost wiped out from Britain thanks to improved agricultural techniques.

The missing grassland plants are more significant. *Coeloglossum viride* was lost a long time ago (1899), from here and from most of lowland Britain. A warming climate and changing land use are probably responsible, as overgrazed, nutrient-poor grassland has largely disappeared as a habitat thanks to atmospheric deposition, conversion to arable and reduced grazing pressure. This ongoing trend is probably also the cause of the loss of *Polygala serpyllifolia* (1943), *Polygala amarella* (1969), *Lysimachia minima* (1986), *Neotinea ustulata* (2006), *Anthyllis vulneraria* (2013) and *Myosotis ramosissima* (2013). They are therophytes or low-growing chamaephytes; small plants which are easily outcompeted by vigorous grasses and scrub. Most of them probably require a high degree of trampling to maintain their habitat. Given that the rate of loss of these plants appears to be increasing, it is a reasonable assumption that other small grassland plants may disappear from Wye soon.

Gains are more difficult to count than losses because new species are being found all the time and there is rarely a comprehensive historical survey to compare them with. To see what sort of new species might be cropping up, we can examine the new finds during the current survey and see if any trends are apparent. So far, some 34 new species have turned up since 2019. Possibly the most informative classification is by two groups: previously overlooked species, which are taxonomically difficult or of restricted distribution, and introductions, which are primarily garden escapes. There seems to be a slight trend in the data towards more woodland (w) and scrub (s) plants in both categories, and this probably does reflect the increasing amount of those habitats, but there are also a few new wetland and grassland plants.

### Gains at Wye Downs since 2019

#### Overlooked

*Athyrium filix-femina* (w)  
*Bromopsis ramosa* (w)  
*Callitriche stagnalis*  
*Centaurea debeauxii*  
*Cirsium palustre*  
*Gnaphalium uliginosum*  
*Hylotelephium telephium*  
*Juncus bufonius*  
*Lemna minor*  
*Mentha x piperita*  
*Silene vulgaris*  
*Sisymbrium officinale*  
*Tilia cordata* (w)  
*Tripleurospermum inodorum*

#### Introductions

*Carex pendula* (w)  
*Cornus alba* (s)  
*Crepis vesicaria*  
*Hedera hibernica* (w)  
*Juglans regia* (w)  
*Lamium galeobdolon* ssp. *argentatum* (w)  
*Melissa officinalis* (s)  
*Oxalis articulata* (s)  
*Quercus ilex* (w)  
*Rubus phoenicolasius* (s)  
*Symphoricarpos albus* (s)  
*Viola odorata* (s)

Overall, it is probably fair to say that the gains and losses of plants at Wye have been minimal, which is not unusual for a well-maintained chalk grassland. However, some of the smaller plants of short grassland have been disappearing, and woodland plants, particularly non-native ones, are on the increase. These are very common trends throughout the English countryside (not so much in Wales and Scotland) but one of the purposes of nature reserves is to resist such changes, so these could be issues that deserves further consideration.

### Ellenberg Indicator Values

The indicator values devised by Heinz Ellenberg (Hill *et al.*, 1999) reflect the conditions experienced by each species in its habitat, in terms of light (L), fertility (N), pH (R), moisture (F) and salinity (S). These can be useful

in detecting changes such as the increasing shadiness of developing woodland and scrub, or a rise in nutrients due to atmospheric deposition. For such an analysis to work, however, it needs lists that are comparable in scope. A full site list would do, but only the gains and losses would count, and there are very few of those. Similarly, if there were lists for grid squares, they could be analysed, but all the old lists are by tetrad, and that is too big a unit to be relevant to the site. The best samples would be small ones, such as NVC quadrats, but the older quadrats we have tend to be from carefully selected locations (for example, where rare plants were found) and therefore do not reflect the general state of the site.

Using the full site lists to check for any increase of shade (which we can be confident has happened) produces the following result. One might expect that more shade-tolerant species ( $L < 5$ , for example) would tend to have a later date of first record and be still present, producing a later last record. No such trend is apparent, however, which either means that there has been no change or that the data is not at sufficiently high resolution to detect it. In a way, perhaps, both are true: there *has* been no overall change in the species composition of the site in this period, but localised changes have occurred that are not detected by this analysis.

Ellenberg Value for L	No. of species	Average first record	Average last record
2 (deep shade)	1	1956	1956
3 (shady – 5% illumination)	3	1978	2020
4	33	1973	2016
5 (semi-shade – 10%)	40	1974	2020
6	49	1981	2020
7 (well-lit places)	142	1974	2017
8	68	1966	2016
9 (full sunlight)	4	1959	2008

At present, therefore, there is only so much that can be done using Ellenberg Values for analysing changes at Wye. In future, however, using data collected during the current survey, such analyses should be more practicable, either using the 1 km scale lists or the quadrats in the vegetation.

## Conservation assessment

The earliest attempt at such an evaluation was undertaken by the Nature Conservancy Council in *A Nature Conservation Review* (Ratcliffe, 1977), where 'Wye and Crundale Downs' is listed as a Grade I site of importance primarily for its chalk grassland, scrub, ash woodland and associated plants and invertebrates. The grassland is described as being of two types: a species-rich variety of *Brachypodium rupestre* grassland and an orchid-rich type of *Festuca ovina* grassland. Because the NCR pre-dates the National Vegetation Classification, no more detail than this is provided on the communities. The woodland, it says, is of ash and coppiced hazel with oak and whitebeam scattered throughout, and scrub of privet, elder and hawthorn on the margins.

Amongst the invertebrates listed, the Feathered Ear moth, *Pachetra sagittigera* (Hufnagel, 1766), is considered the rarest and most important. Unfortunately, it seems that this was already extinct in Britain by the time the NCR was undertaken, as there are no records of it since the 1960s. The larvae feed on grasses, particularly *Poa* spp., so it can be taken as a (historical) feature of the grassland.

Also mentioned is the Black-veined Moth *Siona lineata* (Scopoli, 1763), which is restricted in Britain to East Kent, although it is a common species throughout Europe and Asia. The larvae feed on Wild Marjoram, *Origanum vulgare*, and many other herbs and shrubs, and it is still present at Wye, although the annual count is only about 10-20 adults in four of the compartments. Butterfly Conservation has an active project to conserve this species, and they argue that livestock need to be excluded from compartments with this species in, which suggests that it could be a scrub species. However, it does not persist when the grassland is allowed to scrub over, as has happened in several places that are being managed for this species. Fortunately, the moth has then been discovered in other compartments, where there is still active grazing.

The Silver Leafhopper *Athysanus argentarius* (Metcalf 1955) (confusingly misspelled 'Athysabus' in the NCR) is the third species mentioned. This was once thought to be rare and restricted to SE England, but since then it has spread to other parts of the country and it is no longer considered threatened. It feeds on grasses and is often found in lawns. Finally, *Hermaeophaga mercurialis* (Fabricius, 1793) (also misspelled, as 'Mermaeophaga') is the Dog's-mercury Flea Beetle, a reasonably common insect in southern Britain and, as the name suggests, a woodland species. These invertebrates therefore support the observation that grassland, scrub and woodland are all part of the essential ecology of the reserve.

Another important feature of the reserve is that it was thought to contain 17 species of orchid. This is an impressive total. In fact, that may have been an underestimate, as a total of 20 species (plus two hybrids and a variety) has now been recorded, although *Coeloglossum viride* disappeared over a century ago, and in the last three years only 17 have been spotted. Of the 20, 12 are grassland species, 3 occur primarily in scrub, and 5 are strictly woodland plants. Two of the losses are grassland plants, which means that there are now 10 grassland orchids and 7 of woodland and scrub. (NB, the habitats listed here are the ones they occur in at Wye Downs, rather than generally.)

### Orchids of Wye Downs NNR

Grassland species	last record	Scrub species	
Anacamptis morio	+	Orchis anthropophora	+
Anacamptis pyramidalis	+	Orchis purpurea	+
Coeloglossum viride	1899	Platanthera chlorantha	+
Dactylorhiza fuchsii	+		
Gymnadenia conopsea	+	<b>Woodland species</b>	
Herminium monorchis	+	Cephalanthera damasonium	+
Neotinea ustulata	2006	Epipactis helleborine	+
Ophrys apifera	+	Epipactis purpurata	1956
Ophrys fuciflora	+	Neottia ovata	+
Ophrys sphegodes	+	Ophrys insectifera	+
Orchis mascula	+		
Spiranthes spiralis	+		



Evaluations of a site often come down to a few rare or charismatic species, because this is easy, but there are more rigorous ways of conducting comparisons and assessments. The most effective is probably the use of axiophytes – those species that indicate habitats of conservation importance, such as ancient woods and meadows, or places with unpolluted water. There is a list of some 375 axiophytes for Kent (and similar lists for other counties), drawn up by the county's leading botanists (see [www.bsbi.org/kent](http://www.bsbi.org/kent)). One advantage of using such a list is that it allows comparison between sites, rather than treating each site individually.

Some 98 axiophytes have been recorded in the NNR, which compares well with other notable sites such as Stodmarsh NNR (with 85) and Hothfield Heath SSSI (122).

Some 43 of the axiophytes at Wye are grassland plants, 23 occur in scrub or bare ground and 28 in woodland. This reinforces the view that the grassland is the main feature of interest, although it is interesting to note that the scrub and woodland together are nearly as rich.

### Grassland axiophytes at Wye

(species marked with a dagger are probably no longer present)

Anacamptis morio	Danthonia decumbens	Pimpinella saxifraga
Anacamptis pyramidalis	Euphrasia officinalis	Plantago media
Anthyllis vulneraria†	Filipendula vulgaris	Poa compressa
Asperula cynanchica	Galium verum	Polygala amarella†
Avenula pratensis	Gentianella amarella	Polygala serpyllifolia†
Avenula pubescens	Gymnadenia conopsea	Poterium sanguisorba
Blackstonia perfoliata	Helianthemum nummularium	Rhinanthus minor
Briza media	Herminium monorchis	Scabiosa columbaria
Bromopsis erecta	Hippocrepis comosa	Spiranthes spiralis
Campanula rotundifolia	Koeleria macrantha	Succisa pratensis
Carex caryophylla	Ononis repens	Thymus drucei
Centaurea scabiosa	Ophioglossum vulgatum	Thymus pulegioides
Cirsium acaule	Ophrys fuciflora	Viola hirta
Coeloglossum viride†	Ophrys sphegodes	
Cuscuta epithymum	Orchis mascula	

Nearly all the species listed are calcicoles, but a couple (*Anacamptis morio*, *Ophioglossum vulgatum*) are more mesotrophic, whereas a few are calcifuges (*Danthonia decumbens*, *Polygala serpyllifolia*). This chalk heath element in the flora seems to be too sparse to be considered significant.

It is more difficult to select scrub species, but I suggest the following more-or-less indicate areas of scrub, bare ground and woodland edge. Scrub is a difficult habitat to study and manage because it is always in succession. There is also a widespread view that it is not a good quality habitat, possibly because it is seen as reducing the value of the grassland that it generally replaces. However, at Wye it has long been considered important, and there are several uncommon species other than the axiophytes that are largely restricted to scrub, including *Crepis biennis*, *Euonymus europaeus*, *Sorbus aria*, *Viburnum lantana* and *Viscum album*.

### Scrub axiophytes at Wye

(species marked with a dagger are probably no longer present)

Anthemis cotula	Hypopitys monotropa†	Pimpinella major†
Atropa belladonna	Inula conyzae	Platanthera chlorantha
Carduus nutans	Juniperus communis†	Rhamnus cathartica
Carlina vulgaris	Lithospermum officinale	Rosa micrantha
Clinopodium ascendens	Lysimachia minima	Rosa tomentosa
Cynoglossum officinale	Myosotis ramosissima	Silene vulgaris
Echium vulgare	Orchis anthropophora	Veronica officinalis
Helleborus foetidus	Orchis purpurea	

Woodland plants are well represented at Wye, surprisingly so, perhaps, given that it is thought that the woodland is less than 300 years old. On the whole, however, one could say that the woods at Wye are not especially rich for ancient woodland indicators. Only in Covert Wood is there really a ground flora without scrubland or grassland species, and even there it is rather dominated by *Mercurialis perennis* – a common

plant in hedgerows. One factor holding back the development of the woodland flora could be the intense deer grazing, which leaves only the unpalatable species thriving.

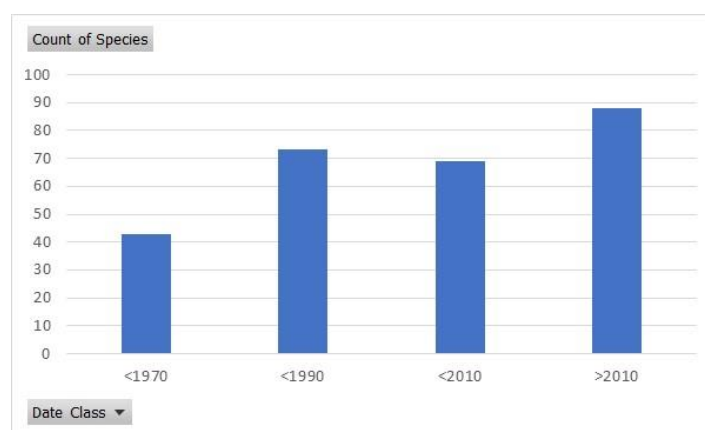
The dividing lines between grassland, scrub and woodland can be vague, and many of the woodland species would thrive under a coppicing regime better than in dense shade. Some, however, such as *Ophrys insectifera* and *Paris quadrifolia*, are plants of closed canopy forest.

#### Woodland axiophytes at Wye

(species marked with a dagger are probably no longer present)

<i>Adoxa moschatellina</i>	<i>Chrysosplenium oppositifolium</i>	<i>Paris quadrifolia</i>
<i>Allium ursinum</i>	<i>Daphne laureola</i>	<i>Poa nemoralis</i>
<i>Anemone nemorosa</i>	<i>Dryopteris affinis</i>	<i>Polystichum aculeatum</i>
<i>Athyrium filix-femina</i>	<i>Epipactis helleborine</i>	<i>Polystichum setiferum</i>
<i>Bromopsis ramosa</i>	<i>Epipactis purpurata</i> †	<i>Ruscus aculeatus</i>
<i>Campanula trachelium</i>	<i>Melica uniflora</i>	<i>Tilia cordata</i>
<i>Carex remota</i>	<i>Milium effusum</i>	<i>Veronica montana</i>
<i>Carex sylvatica</i>	<i>Neottia ovata</i>	<i>Viola reichenbachiana</i>
<i>Carpinus betulus</i>	<i>Ophrys insectifera</i>	
<i>Cephalanthera damasonium</i>	<i>Oxalis acetosella</i>	

Given the number of axiophytes recorded, the NNR fits comfortably into the criteria for a SSSI (more than about 30 species present). The data seems to show a gradual increase in axiophyte diversity since the 1970s, which suggests that the quality of the habitat is improving. Unfortunately, the change could as easily be due to better recording, as some of the gains are species that could easily have been overlooked previously. The apparent gains in the last few years are *Athyrium filix-femina*, *Bromopsis ramosa*, *Glyceria declinata*, *Poa compressa*, *Silene vulgaris* and *Tilia cordata*. It seems unlikely that any of these are genuinely new.



Number of axiophytes recorded in each date class

Only about ten axiophytes, 10%, have been lost over the last century or so. Many important sites in Britain lost a much larger proportion of their species in the 19<sup>th</sup> and 20<sup>th</sup> century, as major changes occurred across the landscape. The losses at Wye do not seem to offer any insight into changes. Some are based on very old records and the species may not in fact have been within the NNR boundary. Others, like *Lysimachia minima* and *Polygala serpyllifolia* are calcifuges and must have been very rare. The significant ones are *Anthyllis vulneraria*, *Orchis ustulata* and *Polygala amarella*. These are plants of closely grazed chalk grassland, and they are probably victims of the spread of *Brachypodium rupestre*, although they were always very rare.

The table in appendix 1 gives more detail on all the plants recorded at Wye, grouped by date class.

The axiophyte analysis therefore supports the view that the reserve has maintained its quality over the years, and that a transition from grassland to woodland is gradually occurring in parts of the site, causing a slow increase in diversity of habitat and species richness overall. However, there are some conservation issues that deserve further consideration.

Firstly, some rare grassland species have been lost, and these losses look likely to continue. Is it possible, therefore, to protect and enhance the populations of some of the most vulnerable species?

Secondly, there is the grassland at the top and the bottom of the escarpment which has been ploughed, reseeded or otherwise agriculturally damaged in the past. These fields appear to be gradually recovering and adding to the axiophyte diversity of the site, but is there an optimal way to facilitate that recovery, and do we know where it will eventually go – to neutral or calcareous conditions?

Finally, the woodland itself, although a success story so far, appears to be rather vulnerable. In the last few years many of the ash trees on the drier slopes have succumbed to Ash Dieback, and other parts of the woodland are composed largely of elm, which must also be considered vulnerable to disease. Is there any management that would help to make the woodland more resilient, and to what extent should species that do not seem to occur naturally at Wye be encouraged to spread?



## Management

There are many competing influences on the management of any nature reserve, and often there is no over-riding objective to govern management actions. At Wye Downs it would be possible to argue that maintaining the short grassland habitat that has prevailed for the last 2,500 years is a clear objective; but to do that over the whole site would be difficult and expensive. It would also have negative consequences for many species, and there is no obvious reason to perpetuate what was essentially an agricultural landscape if the economic justification for it no longer exists. Keeping some of the grassland in good condition may be sufficient to maintain the features of interest.

There are some clear objectives for the NNR which were set out in the original legislation and which have been endorsed by numerous policies since then. One should clearly maximise, or perhaps optimise, the wildlife value of the reserve whilst facilitating public access and recreation and encouraging research and study. These three objectives: biodiversity, access and research are the basis of the management strategy.

From the point of view of conserving the plants, there are some obvious priorities. Two species are rare and of national significance: *Ophrys fuciflora* and *Polygala amarella*. They do not require much space, and it should be easy enough to maintain healthy populations of these whilst allowing all other objectives to be met.

Unfortunately, one of them (*Polygala*) appears to have been lost some time ago, and the other is tricky to manage. It has been possible to maintain the existing colonies, but nobody has yet found a reliable way to increase them or establish new ones. Developing ways to look after these two species would be a good way to contribute to the research element of the strategy.

Another priority is to maintain at least some of the open chalk grassland for which the Downs are so famous. There are many hectares of this within the NNR, and no reason whatsoever why plenty of it should not continue to be species-rich grassland, even if certain parts are allowed to continue to succeed to scrub and woodland. The key grassland type is *Festuca ovina* (CG2), which deteriorates into CG4 *Brachypodium rupestre* or CG5 *Bromopsis erecta* with the increasing dominance of those species. Preventing *B. rupestre* (Tor Grass) from becoming too dominant has perhaps been the biggest problem for site managers since the rabbit population declined in the 1950s.

Other habitats on the reserve are of secondary importance from a botanical point of view. The woodland has many uncommon and characteristic plants, but they do not generally need any special attention. Woodland and scrub tend to get managed for other purposes. Coppicing and scrub clearance favour species such as *Orchis anthropophora* and *O. purpurea*, while high forest is favourable for *Ophrys insectifera* and *Cephalanthera damasonium*. Any normal woodland management programme is likely to support a range of species, and no priorities spring to mind. The main issue in the woods at present is *Hymenoscyphus fraxineus* Ash Dieback, which has killed many of the trees on the drier slopes. Presumably, the Dutch Elm Disease epidemic in the 1970s had a similar effect, although that is not documented at Wye.

Tree diseases have the long-term effect of diversifying the woods, by opening up the canopy to competition. This is not necessarily viewed with pleasure by conservationists, as the benefactors are likely to be weed species such as sycamore or non-natives such as Turkey Oak and Holm Oak. One could attempt to counter that by planting native species such as cherry, lime, beech and aspen, but if these do not occur naturally at Wye (or at least, not in any abundance) is this actually any better?

For the reserve manager, the most effective and important action they undertake is to control the grazing on the reserve. At present, Winchcombe Down is managed as pasture and grazed by cattle in the traditional manner. Wye Downs is not: grazing by livestock has been patchy and intermittent. Scrub has been kept in check partly by volunteer work teams. The small herd of Fallow Deer provide most of the grazing pressure within the reserve. They tend to stick to the woodland during the day, but they wander into the grassland at night. It is not obvious what effect quite heavy deer browsing has on the woods. Certainly, Newgate Scrubs (where the deer spend most of their time) has very little ground flora in the summer, and it seems quite impoverished because of this. The deer feed preferentially on certain species whilst allowing others, such as *Allium ursinum*, to flourish. One of the most common effects of deer is to prevent recruitment of trees, and

this could be advantageous at Wye, but the canopy is so dense that it could be many years before it makes much difference to the habitat.

One obvious possibility for the management of Wye would be to remove all the fences within the reserve and establish a herd of grazing animals such as Highland Cattle and Konik Ponies, as an exercise in rewilding. If the objective is to maintain a matrix of woodland, scrub and grassland, as has effectively developed since the reserve was established, then this could be a practical way to continue that process without worrying about the economics and practicalities of cattle rearing in the grassland compartments.

Whatever the overall management strategy, there are some practical and affordable initiatives which would seem to contribute to the main objectives of the reserve.

Conserving the grassland orchids is undoubtedly worthwhile. *Ophrys fuciflora*, Late Spider-orchid, is widely seen as the key flagship species at Wye. There are currently 4 colonies. This could be a decline from 6, although perhaps the missing 2 were just subdivisions of the existing patches. The number of individual plants has remained stable for fifty years or so, despite numerous attempts to cause an increase. From the point of view of securing their long-term future, it is vital to find out what is required to facilitate recruitment. It seems possible (but not inevitable) that the right management might also favour other missing or declining species such as *Anthyllis vulneraria*, *Avenula pratensis*, *Koeleria macrantha*, *Neotinea ustulata*, *Ophrys sphegodes* and *Polygala amarella*.

One key to *O. fuciflora* is that it likes disturbance. Three of the four populations are in old quarries and the fourth is on an eroded slope. It seems that bare and possibly crushed chalk is the essential element. This could be because of the high pH or some other aspect of the soil chemistry, or possibly of the fungal associations of such a skeletal soil. A good starting point would be to experiment with the creation of areas of bare, crushed chalk in the vicinity of the existing populations, just to see if natural recruitment occurs. It is interesting to note that the quarries at Quarry Spur and Crown Field, which have exposed chalk, do not have any rarities. This could be because the rock faces are leached and eroded by rainwater. What may be required is a layer of crushed chalk or marl on gently sloping ground so that the runoff is not too rapid. If that does not work after a few years, one could explore other avenues or invite researchers to investigate.

Secondly, grassland management is something which needs further study and experimentation. There is ample evidence that the chalk grassland at Wye has been insufficiently grazed since about the 1950s, partly because of the reduction in the number of rabbits, and partly due to the reduced intensity of sheep rearing. This has led to the decline of many species and the disappearance of some. Unlike the orchids mentioned above, there is no obvious link between most grassland species and soil disturbance. Having said that, trampling has been the best substitute for grazing, and the intensively visited areas at Crown Field are now some of the best-preserved pieces of grassland.

As it is not practical or desirable to manage the whole reserve as short grassland, it would be ideal to designate some areas for intensive management. This could include burning, mowing, harrowing, grazing and trampling – whatever it takes to reduce the density of the *Brachypodium rupestre* and create an open, short sward dominated by grasses such as *Festuca ovina*, *Briza media*, *Avenula pubescens*, *A. pratensis* and *Koeleria macrantha*. The idea would be to take one compartment, or part of a compartment, and put extra effort into managing the sward there for a few years, to see how it responds.

These two initiatives could be very helpful for the future management of the reserve. For example, if we knew a reliable method for increasing the orchid populations, one could use that intervention over a restricted area whilst entrusting the rest of the reserve to a more extensive process such as rewilding or low intensity grazing. Similarly, being able to preserve certain areas of grassland for the rare plants allows exploration of techniques to encourage other wildlife such as Lepidoptera, elsewhere. Two key considerations are how to document such experiments so that any lessons can be learned, and how to continue them for long enough to produce changes.

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Herbarium specimens from the following collections have been utilised in this report. My thanks are due to the curators for permission to digitise their data.

ABS – the University of Wales, Aberystwyth  
BIRM – University of Birmingham  
BM – the Natural History Museum, London  
BON – Bolton Museum  
CGE – Cambridge University  
K – the Royal Botanic Gardens, Kew

MANCH – Manchester Museum  
MNE - Maidstone Museum  
NMW – the National Museum of Wales, Cardiff  
RNG – Reading University  
SHYB – Shrewsbury School Biology Department  
SLBI – South London Botanical Institute

## List of recorders, showing number of records

Armishaw, Ms J.	2	Hookham, Mr P.	1	Pigott, Prof C.D.	65
Bedford, E.J.	1	Huntley, Ms J.P.	180	Pitt, Ms J.	1
Benson, Mrs	1	Hurst, Mr C.P.	2	Poingdestre, J.	1
Blaker, Mr M.S.	1	Jeffrey, Mr J.F.	1	Pope, Mr C.N.	1
Boniface, Mr R.A.	1	Jeffrey, Mr W.R.	7	Puckett, Dr J.	1
Brooke, Mr B.J.	2	Johnson, D.	4	Richardson, Mr G.	3
Buckingham, Mrs S.	445	Jupp, A.	1	Ridley, W.	1
Burges, Dr R.E.L.	1	Kesby, J.	1	Rooney, Mr L.	166
Catlin, D.	1	Keymer, R.J.	1	Rose, Dr F.	110
Coates, S.	57	Kitchener, Mr G.D.	44	Rumsey, Dr F.J.	1
Cobbe, Miss M.	3	Kitching, Mr L.	9	Russell, B.J.S.	1
Cooper, Mr A.	1	Lang, Mr D.C.	5	Salmon, Mr C.E.	3
Druce, Dr G.C.	4	Lemon, Mr S.	1	Smith, Rev G.E.	3
Duffield, Mr J.C.H.	125	Lewis, G.P.	1	Stanley, Mr P.D.	2
Duthie, Prof J.F.	11	Linton, Rev W.R.	1	Stanton, H.	1
Fearn, Dr G.M.	36	Lloyd, M.	57	Steere, Mr D.	1
FitzGerald, Lady R.	3	Lousley, Mr J.E.	1	Summerhayes, Mr V.S.	1
Freeman, Mr G.	4	Lowne jnr., Mr B.T.	1	Tangye, Ms A.	2
Gay, Mr A.	244	Mackeson, Mr H.B.	1	Tattersall, B.G.	1
Gay, Mr P.	2	Malden, Rev B.	1	Teasdale, Mr C.	1
Graham, Mr R.A.H.	2	Marshall, Rev E.S.	5	Trueman, Prof. I.C.	3
Grant, Mr D.	1	Marten, Mr J.	1	Tyler, Mr J.P.	5
Griffin, Mr P.	5	Maylam, D.	2	Ullman, Mr R.B.	1
Griffin, Mr W.H.	3	Mitchley, Dr J.	68	Wakeley, Mr P.	1
Hammond, Mr W.H.	3	Mobarak, Miss J.	283	Walker, Miss H.	1
Hanbury, Mr F.J.	9	Newbould, Rev W.W.	1	Walters, Dr S.M.	1
Harris, Miss G.W.	1	Osborne, Mr C.	188	Ward, Mr F.H.	1
Heath, Rev D.M.	2	Percival, Prof J.	2	Ware, Mrs C.	63
Heathcote, Mr P.	1	Perring, Dr F.	1	Wedgwood, Mrs M.L.	1
Holmes, Mr E.M.	1	Philp, Mr E.G.	1238	Worsdell, Mr W.C.	2



## References

- Bannister, N.R. & Watt, T.A. 1997. *Wye: 10,000 Years of a Kentish Community and its Landscape*. Wye College Press, Wye.
- Bock, M., Xofis, P., Mitchley, J., Rossner, G. & Wissen, M. 2005. Object-oriented methods for habitat mapping at multiple scales – Case studies from Northern Germany and Wye Downs, UK. *Journal for Nature Conservation*, 13, 75-89.
- CEH. 2016. MAVIS Plot Analyser v. 1.04. Centre for Ecology and Hydrology.
- Duffield, J.C.H. 1977. *Some vegetational changes on part of the North Downs in East Kent with particular reference to the area covered by the Wye and Crundale Downs National Nature Reserve*. Unpublished report by the Nature Conservancy Council, Wye.
- Duffield, J.C.H. 1979. *Observations on the survival and flowering of some Late Spider Orchids, Ophrys fuciflora on the North Downs in East Kent, with particular reference to the colonies on the Wye National Nature Reserve*. Unpublished report by the Nature Conservancy Council, Wye.
- Freeman, G. 1842. *A Catalogue of Flowering Plants and Ferns growing in the vicinity of Wye*. In Morris, W.S. (1842) *The History and Topography of Wye*. Canterbury.
- Green, B.H. 1973. Practical aspects of chalk grassland management in the Nature Conservancy's South-East Region. In *Chalk Grassland: Studies on its Conservation and Management in South-east England*, ed. A.C. Jermy & P.A. Stott, pp. 42-7. Kent Trust for Nature Conservation, Maidstone.
- Griffin, P., 2019. Wye NNR Management Plan 2019-2024. Unpublished report by Natural England.
- Hanbury, F.J. & Marshall, F.J. 1899. *Flora of Kent*. Frederick J. Hanbury, London.
- Hill, M.O., Mountford, J.O., Roy, D.B. & Bunce, R.G.H. 1999. Ellenberg's indicator values for British plants. ECOFACT Volume 2. Technical Annex. Institute of Terrestrial Ecology.
- Kerney, M.P., Brown, E.H. & Chandler, T.J. 1964. The Late-glacial and Post-glacial History of the Chalk Escarpment near Brook, Kent. *Philosophical Transactions of the Royal Society of London*, vol. 248, 135-204.
- Lambert, C.A. 1964. Late-glacial Plant Remains. In Kerney, M.P., Brown, E.H. & Chandler, T.J. 1964., Appendix 1. *Philosophical Transactions of the Royal Society of London*, vol. 248, 193-197.
- Perring, F.H. & Walters, S.M. 1962. *Atlas of the British Flora*. Botanical Society of the British Isles, London.
- Philp, E.G. 1982. *Atlas of the Kent Flora*. Kent Field Club.
- Philp, E.G. 2010. *A New Atlas of the Kent Flora*. Kent Field Club.
- Pisces Conservation Ltd. 2004. Community Analysis Package, v. 3.1.
- Ratcliffe, D. (ed.) 1977. *A Nature Conservation Review*. Cambridge University Press, Cambridge.
- Rodwell, J.S. (ed.) 1991-2000. *British Plant Communities*, vols. 1-5. Cambridge University Press.
- Stace, C.A. 1975. *Hybridization and the Flora of the British Isles*. Academic Press, London.
- Stace, C.A. 2019. *New Flora of the British Isles*, 4<sup>th</sup> ed. C & M Floristics, Middlewood Green.
- Stace, C.A., Preston, C.D. & Pearman, D.A. 2015. *Hybrid Flora of the British Isles*. Botanical Society of Britain and Ireland, Bristol.
- Stone, D.A. & Russell, R.V. 2000. Population biology of late spider orchid *Ophrys fuciflora* - A study at Wye National Nature Reserve 1987-1998. *English Nature Research Reports* No. 389. English Nature, Peterborough.

- Tansley, A.G. 1953. *The British Islands and their Vegetation*. Cambridge University Press, London.
- Waller, M.P. & Hamilton, S. 2000. Vegetation history of the English chalklands: a mid-Holocene pollen sequence from the Caburn, East Sussex. *Journal of Quaternary Science* 15: 253–272.
- Watt, T.A. & Chapman, G.P. 1994. *The Natural History of a Country Estate: Wye College, Kent*. Wye College Press, Wye.
- Sowerby, J. & Smith, J.E. 1790-1835. *English Botany*. James Sowerby, London.
- Cowell, M.H. 1839. *Floral Guide for East Kent, etc., being a record of the habitats of indigenous plants found in the eastern division of the county of Kent, with those of Faversham particularly detailed, and definitely exhibited*. W. Ratcliffe, Faversham.

## Appendix 1: species list

Summary of all records, in alphabetical order. Status is given for axiophytes. Presence in each area, Wye Downs, Crown Field and Winchcombe. Date class 1 is everything up to the 1970s, which includes Hanbury & Marshall (1899) and Francis Rose's unpublished Flora; DC 2 is 1975-1989, which includes Eric Philp's first Atlas and some NCC studies; DC3 is 1995-2009, which is Eric Philp's second Atlas; and DC4 is everything since 2010, which is mostly data collected by the Kent Botanical Recording Group and the current survey.

Species	Common Name	Status	Crown	Winch.	Wye	1	2	3	4
<i>Chara globularis</i>	Fragile Stonewort	axio	-	-	+	-	-	-	+
<i>Brachythecium rutabulum</i>	Rough-stalked Feather-moss	-	+	+	+	-	+	-	+
<i>Bryum argenteum</i>	Silver-moss	-	-	-	+	-	-	-	+
<i>Bryum capillare</i>	Capillary Thread-moss	-	-	-	+	-	-	-	+
<i>Bryum dichotomum</i>	Bicoloured Bryum	-	-	-	+	-	-	-	+
<i>Bryum rubens</i>	Crimson-tuber Thread-moss	-	-	-	+	-	-	-	+
<i>Ceratodon purpureus</i>	Redshank	-	-	-	+	-	+	-	+
<i>Ctenidium molluscum</i>	Chalk Comb-moss	-	+	-	+	+	-	-	+
<i>Didymodon insulanus</i>	Cylindric Beard-moss	-	-	-	+	-	-	-	+
<i>Entodon concinnus</i>	Montagne's Cylinder-moss	axio	+	-	-	+	-	-	-
<i>Eurhynchium striatum</i>	Common Striated Feather-moss	-	-	-	+	-	-	-	+
<i>Fissidens adianthoides</i>	Maidenhair Pocket-moss	-	-	-	+	-	-	-	+
<i>Fissidens dubius</i>	Rock Pocket-moss	-	+	-	+	+	-	-	-
<i>Fissidens incurvus</i>	Short-leaved Pocket-moss	-	-	-	+	-	-	-	+
<i>Fissidens taxifolius</i>	Common Pocket-moss	-	-	+	+	-	+	-	+
<i>Frullania dilatata</i>	Dilated Scalewort	-	-	-	+	-	-	-	+
<i>Funaria hygrometrica</i>	Common Cord-moss	-	-	-	+	-	-	-	+
<i>Homalothecium lutescens</i>	Yellow Feather-moss	-	+	-	+	-	+	-	+
<i>Hypnum cupressiforme</i>	Cypress-leaved Plait-moss	-	-	-	+	-	-	-	+
<i>Kindbergia praelonga</i>	Common Feather-moss	-	-	+	+	-	+	-	+
<i>Lewinskya affinis</i>	Wood Bristle-moss	-	-	-	+	-	-	-	+
<i>Metzgeria furcata</i>	Forked Veilwort	-	-	-	+	-	-	-	+
<i>Neckera complanata</i>	Flat Neckera	-	-	-	+	-	-	-	+
<i>Neckera crispa</i>	Crisped Neckera	-	+	-	+	+	-	-	+
<i>Oxyrrhynchium hians</i>	Swartz's Feather-moss	-	+	-	+	+	-	-	+
<i>Pellia endiviifolia</i>	Endive Pellia	-	-	-	+	-	-	-	+
<i>Plagiomnium undulatum</i>	Hart's-tongue Thyme-moss	-	-	-	+	-	-	-	+
<i>Pseudoscleropodium purum</i>	Neat Feather-moss	-	+	+	+	+	-	-	+
<i>Radula complanata</i>	Even Scalewort	-	-	-	+	-	-	-	+
<i>Rhynchostegium megapolitanum</i>	Indian Feather-moss	-	-	-	+	-	-	-	+
<i>Seligeria calycina</i>	English Rock-bristle	-	-	-	+	-	-	-	+
<i>Thamnobryum alopecurum</i>	Fox-tail Feather-moss	-	-	-	+	-	-	-	+
<i>Trichostomum brachydontium</i>	Variable Crisp-moss	-	-	-	+	-	-	-	+
<i>Weissia angustifolia</i>	Crisp Beardless-moss	-	-	-	+	-	-	-	+
<i>Weissia controversa</i>	Green-tufted Stubble-moss	-	-	-	+	+	-	-	+
<i>Acer campestre</i>	Field Maple	-	+	+	+	-	+	+	+
<i>Acer platanoides</i>	Norway Maple	-	+	-	+	-	-	+	+
<i>Acer pseudoplatanus</i>	Sycamore	-	+	+	+	-	+	+	+
<i>Achillea millefolium</i>	Yarrow	-	+	+	+	+	+	+	+
<i>Adoxa moschatellina</i>	Moschatel	axio	+	+	+	-	+	+	+
<i>Aegopodium podagraria</i>	Ground-elder	-	+	-	-	-	+	+	+
<i>Agrimonia eupatoria</i>	Agrimony	-	+	+	+	-	+	+	+
<i>Agrostis capillaris</i>	Common Bent	-	+	+	+	-	+	+	+
<i>Agrostis stolonifera</i>	Creeping Bent	-	+	+	+	+	+	+	+
<i>Aira caryophyllea</i>	Silver Hair-grass	axio	+	-	-	-	-	+	+
<i>Ajuga reptans</i>	Bugle	-	+	+	+	+	+	+	+
<i>Alliaria petiolata</i>	Garlic Mustard	-	+	+	+	-	+	+	+
<i>Allium ursinum</i>	Ramsons	axio	+	+	+	-	+	+	+
<i>Anacamptis morio</i>	Green-winged Orchid	axio	+	-	-	+	+	+	+
<i>Anacamptis pyramidalis</i>	Pyramidal Orchid	axio	+	+	+	-	+	+	+
<i>Anemone nemorosa</i>	Wood Anemone	axio	+	+	+	-	+	+	+
<i>Angelica sylvestris</i>	Wild Angelica	-	-	-	+	-	+	+	+
<i>Anisantha sterilis</i>	Barren Brome	-	+	+	+	-	+	+	+
<i>Anthemis cotula</i>	Stinking Chamomile	axio	-	-	+	-	-	-	+
<i>Anthoxanthum odoratum</i>	Sweet Vernal Grass	-	+	+	+	-	+	+	+



Anthriscus sylvestris	Cow Parsley	-	+	+	+	-	+	+	+
Anthyllis vulneraria	Kidney Vetch	axio	+	+	+	-	+	+	+
Aphanes arvensis	Parsley-piert	-	+	+	+	+	+	+	+
Aquilegia vulgaris	Columbine	-	-	-	+	-	+	-	+
Arctium lappa	Greater Burdock	-	-	-	+	-	+	-	+
Arctium minus	Lesser Burdock	-	+	+	+	-	+	+	+
Arenaria serpyllifolia	Thyme-leaved Sandwort	-	+	+	+	-	+	+	+
Arrhenatherum elatius	False Oat-grass	-	+	+	+	+	+	+	+
Artemisia vulgaris	Mugwort	-	+	+	+	-	+	+	+
Arum maculatum	Lords-and-ladies	-	+	+	+	-	+	+	+
Asperula cynanchica	Squinancywort	axio	+	+	+	+	+	+	+
Asplenium scolopendrium	Hart's-tongue	-	-	-	+	-	+	+	+
Athyrium filix-femina	Lady Fern	axio	-	-	+	-	-	-	+
Atropa belladonna	Deadly Nightshade	axio	-	+	+	+	+	+	+
Avenula pratensis	Meadow Oat-grass	axio	+	+	+	+	+	+	+
Avenula pubescens	Downy Oat-grass	axio	+	+	+	-	+	+	+
Ballota nigra	Black Horehound	-	+	+	+	-	+	+	+
Bellis perennis	Daisy	-	+	+	+	+	+	+	+
Betula pendula	Silver Birch	-	+	+	+	-	+	+	+
Blackstonia perfoliata	Yellow-wort	axio	+	+	+	+	+	+	+
Brachypodium rupestre	Tor-grass	-	+	+	+	+	+	+	+
Brachypodium sylvaticum	False-brome	-	+	+	+	-	+	+	+
Briza media	Quaking-grass	axio	+	+	+	+	+	+	+
Bromopsis erecta	Upright Brome	axio	+	+	+	+	+	+	+
Bromopsis ramosa	Hairy Brome	axio	-	+	-	-	-	-	+
Bromus hordeaceus	Soft-brome	-	+	+	+	-	+	+	+
Bromus racemosus	Smooth Brome	-	-	-	+	-	+	-	+
Bryonia dioica	White Bryony	-	+	+	+	-	+	+	+
Buddleja davidii	Butterfly-bush	neophyte	-	-	+	-	+	+	+
Callitriche stagnalis	Common Water-starwort	-	-	+	-	-	-	-	+
Campanula rotundifolia	Harebell	axio	+	-	+	+	+	+	+
Campanula trachelium	Nettle-leaved Bellflower	axio	+	+	+	-	+	+	+
Cardamine pratensis	Cuckooflower	-	+	+	+	-	+	+	+
Carduus crispus	Wetted Thistle	-	+	+	+	+	+	+	+
Carduus nutans	Musk Thistle	axio	+	+	+	-	+	+	+
Carex caryophyllaea	Spring Sedge	axio	+	+	+	+	+	+	+
Carex flacca	Glaucous Sedge	-	+	+	+	+	+	+	+
Carex hirta	Hairy Sedge	-	-	-	+	-	-	-	+
Carex pendula	Pendulous Sedge	-	-	-	+	-	-	-	+
Carex remota	Remote Sedge	axio	-	-	+	-	+	+	+
Carex sylvatica	Wood-sedge	axio	+	+	+	-	+	+	+
Carlina vulgaris	Carline Thistle	axio	+	+	+	+	+	+	+
Carpinus betulus	Hornbeam	axio	+	+	+	-	+	+	+
Castanea sativa	Sweet Chestnut	-	-	+	+	-	+	-	+
Catapodium rigidum	Fern-grass	-	+	-	+	-	-	-	+
Centaurea debeauxii	Chalk Knapweed	-	-	-	+	-	-	-	+
Centaurea nigra	Common Knapweed	-	+	+	+	+	+	+	+
Centaurea scabiosa	Greater Knapweed	axio	+	+	+	+	+	+	+
Centaureum erythraea	Common Centaury	-	+	+	+	+	+	+	+
Cephalanthera damasonium	White Helleborine	axio	-	-	+	+	+	-	+
Cerastium fontanum	Common Mouse-ear	-	+	+	+	-	+	+	+
Cerastium glomeratum	Sticky Mouse-ear	-	+	+	+	-	+	+	+
Chaerophyllum temulum	Rough Chervil	-	+	+	+	-	+	+	+
Chamaenerion angustifolium	Rosebay Willowherb	-	-	-	+	-	+	+	+
Chrysosplenium oppositifolium	Opposite-leaved Golden-saxifrage	axio	-	-	+	-	+	+	+
Circaea lutetiana	Enchanter's-nightshade	-	+	+	+	-	+	+	+
Cirsium acaule	Dwarf Thistle	axio	+	+	+	+	+	+	+
Cirsium arvense	Creeping Thistle	-	+	+	+	+	+	+	+
Cirsium palustre	Marsh Thistle	-	-	+	+	-	-	-	+
Cirsium vulgare	Spear Thistle	-	+	+	+	+	+	+	+
Clematis vitalba	Traveller's Joy	-	+	+	+	-	+	+	+
Clinopodium ascendens	Common Calamint	axio	+	-	+	+	+	-	+
Clinopodium vulgare	Wild Basil	-	+	+	+	-	+	+	+
Coeloglossum viride	Frog Orchid	axio	-	-	+	+	-	-	-
Convolvulus arvensis	Field Bindweed	-	+	+	+	-	+	+	+
Cornus alba	White Dogwood	-	-	-	+	-	-	-	+
Cornus sanguinea	Dogwood	-	+	+	+	-	+	+	+
Corylus avellana	Hazel	-	+	+	+	-	+	+	+
Cotoneaster franchetii	Franchet's Cotoneaster	-	-	-	+	-	-	+	+
Cotoneaster horizontalis	Wall Cotoneaster	-	+	+	+	-	-	+	+
Crataegus monogyna	Hawthorn	-	+	+	+	-	+	+	+

Crepis biennis	Rough Hawk's-beard	-	-	-	+	-	+	+	+
Crepis capillaris	Smooth Hawk's-beard	-	+	+	+	-	+	+	+
Crepis vesicaria	Beaked Hawk's-beard	-	-	-	+	-	-	-	+
Cruciata laevipes	Crosswort	-	+	+	+	+	+	+	+
Cuscuta epithymum	Dodder	axio	-	-	+	+	+	-	+
Cynoglossum officinale	Hound's-tongue	axio	-	+	+	+	+	+	+
Cynosurus cristatus	Crested Dog's-tail	-	+	+	+	+	+	+	+
Cytisus scoparius	Broom	-	-	+	-	-	+	+	+
Dactylis glomerata	Cock's-foot	-	+	+	+	+	+	+	+
Dactylorhiza fuchsii	Common Spotted-orchid	-	+	+	+	+	+	+	+
Danthonia decumbens	Heath-grass	axio	+	-	+	-	-	+	+
Daphne laureola	Spurge-laurel	axio	-	+	+	-	+	+	+
Deschampsia cespitosa	Tufted Hair-grass	-	-	+	+	-	-	-	+
Dipsacus fullonum	Wild Teasel	-	+	+	+	-	+	+	+
Draba muralis	Wall Whitlowgrass	-	-	-	+	+	-	-	-
Dryopteris affinis	Scaly Male-fern	axio	-	-	+	-	-	+	+
Dryopteris dilatata	Broad Buckler-fern	-	+	+	+	-	+	+	+
Dryopteris filix-mas	Common Male Fern	-	+	+	+	-	+	+	+
Echium vulgare	Viper's Bugloss	-	+	+	+	-	+	+	+
Elymus repens	Common Couch	-	+	-	-	-	-	+	-
Epilobium hirsutum	Great Willowherb	-	-	-	+	-	+	+	+
Epilobium parviflorum	Hoary Willowherb	-	-	+	+	-	+	+	+
Epipactis helleborine	Broad-leaved Helleborine	-	-	-	+	+	+	-	+
Epipactis purpurata	Violet Helleborine	axio	-	-	+	+	-	-	-
Equisetum arvense	Field Horsetail	-	-	-	+	-	+	+	+
Euonymus europaeus	Spindle	-	+	+	+	-	+	+	+
Eupatorium cannabinum	Hemp-agrimony	-	+	-	+	-	+	+	+
Euphrasia nemorosa	Eyebright	axio	+	+	+	+	+	+	+
Euphrasia officinalis	Eyebright	axio	-	+	+	+	+	-	+
Euphrasia pseudokernerii	Chalk Eyebright	axio	+	-	+	-	+	+	+
Fagus sylvatica	Beech	-	+	+	+	-	+	+	+
Festuca ovina	Sheep's Fescue	-	+	+	+	+	+	+	+
Festuca rubra	Red Fescue	-	+	+	+	-	+	+	+
Ficaria verna	Lesser Celandine	-	+	+	+	-	+	+	+
Filipendula vulgaris	Dropwort	axio	+	-	+	+	+	+	+
Fragaria vesca	Wild Strawberry	-	+	+	+	-	+	+	+
Fraxinus excelsior	Ash	-	+	+	+	-	+	+	+
Galeopsis tetrahit	Common Hemp-nettle	-	-	+	-	-	-	+	+
Galium album	Hedge Bedstraw	-	+	+	+	+	+	+	+
Galium aparine	Cleavers	-	+	+	+	-	+	+	+
Galium tricornutum	Corn Cleavers	-	-	-	+	+	-	-	-
Galium verum	Lady's Bedstraw	axio	+	+	+	+	+	+	+
Gentianella amarella	Autumn Gentian	axio	+	+	+	+	+	+	+
Geranium dissectum	Cut-leaved Crane's-bill	-	+	+	+	-	+	+	+
Geranium molle	Dove's-foot Crane's-bill	-	+	+	+	-	+	+	+
Geranium robertianum	Herb-robert	-	+	+	+	-	+	+	+
Geum urbanum	Wood Avens	-	+	+	+	-	+	+	+
Glechoma hederacea	Ground-ivy	-	+	+	+	-	+	+	+
Glyceria declinata	Small Sweet-grass	axio	-	+	-	-	-	-	+
Gnaphalium uliginosum	Marsh Cudweed	-	-	+	-	-	-	-	+
Gymnadenia conopsea	Chalk Fragrant-orchid	axio	+	+	+	+	+	+	+
Hedera helix	Ivy	-	+	+	+	-	+	+	+
Hedera hibernica	Atlantic Ivy	-	-	+	-	-	-	-	+
Helianthemum nummularium	Common Rock-rose	axio	+	+	+	+	+	+	+
Helleborus foetidus	Stinking Hellebore	axio	-	-	+	-	-	+	+
Helminthotheca echioides	Bristly Oxtongue	-	+	+	+	-	+	+	+
Helosciadium nodiflorum	Fool's Watercress	-	-	-	+	-	+	+	+
Heracleum sphondylium	Hogweed	-	+	+	+	-	+	+	+
Herminium monorchis	Musk Orchid	axio	-	+	+	+	+	-	+
Hippocrepis comosa	Horseshoe Vetch	axio	+	+	+	+	+	+	+
Holcus lanatus	Yorkshire-fog	-	+	+	+	+	+	+	+
Hordeum secalinum	Meadow Barley	-	-	-	+	-	+	+	+
Hyacinthoides non-scripta	Bluebell	-	+	+	+	-	+	+	+
Hylotelephium telephium	Orpine	axio	-	-	+	-	-	-	+
Hypericum androsaemum	Tutsan	-	-	-	+	+	-	-	+
Hypericum hirsutum	Hairy St John's-wort	-	+	+	+	-	+	+	+
Hypericum perforatum	Perforate St John's-wort	-	+	+	+	+	+	+	+
Hypericum x inodorum	Tall Tutsan	-	-	-	+	-	-	-	+
Hypochaeris radicata	Cat's-ear	-	+	+	+	-	+	+	+
Hypopitys monotropa	Yellow Bird's-nest	axio	-	-	+	+	-	-	-
Ilex aquifolium	Holly	-	+	+	+	-	+	+	+

<i>Inula conyzae</i>	Ploughman's-spikenard	axio	+	+	+	-	+	+	+
<i>Iris foetidissima</i>	Stinking Iris	-	+	+	+	-	+	+	+
<i>Jacobaea erucifolia</i>	Hoary Ragwort	-	-	+	+	-	+	+	+
<i>Jacobaea vulgaris</i>	Ragwort	-	+	+	+	-	+	+	+
<i>Juglans regia</i>	Walnut	-	-	-	+	-	-	-	+
<i>Juncus bufonius</i>	Toad Rush	-	-	+	-	-	-	-	+
<i>Juncus effusus</i>	Soft-rush	-	-	+	-	-	+	-	+
<i>Juniperus communis</i>	Juniper	axio	-	-	+	+	-	-	+
<i>Knautia arvensis</i>	Field Scabious	-	+	+	+	-	+	+	+
<i>Koeleria macrantha</i>	Crested Hair-grass	axio	+	+	+	+	+	+	+
<i>Lamium album</i>	Yellow Archangel	-	+	+	+	-	+	+	+
<i>L. galeobdolon</i> ssp. <i>argentatum</i>	Garden Yellow Archangel	-	+	-	+	-	-	-	+
<i>Lamium album</i>	White Dead-nettle	-	+	+	+	-	+	+	+
<i>Lapsana communis</i>	Nipplewort	-	+	+	+	-	+	+	+
<i>Lathyrus pratensis</i>	Meadow Vetchling	-	+	+	+	-	+	+	+
<i>Lemna minor</i>	Common Duckweed	-	-	-	+	-	-	-	+
<i>Leontodon hispidus</i>	Rough Hawkbit	-	+	+	+	+	+	+	+
<i>Leontodon saxatilis</i>	Lesser Hawkbit	-	+	+	+	+	+	-	+
<i>Leucanthemum vulgare</i>	Oxeye Daisy	-	+	+	+	+	+	+	+
<i>Ligustrum vulgare</i>	Wild Privet	-	+	+	+	-	+	+	+
<i>Linum catharticum</i>	Fairy Flax	-	+	+	+	+	+	+	+
<i>Lithospermum officinale</i>	Common Gromwell	axio	+	+	+	-	+	+	+
<i>Lolium perenne</i>	Perennial Rye-grass	-	+	+	+	+	+	+	+
<i>Lonicera periclymenum</i>	Honeysuckle	-	+	+	+	-	+	+	+
<i>Lotus corniculatus</i>	Common Bird's-foot-trefoil	-	+	+	+	+	+	+	+
<i>Luzula campestris</i>	Field Wood-rush	-	+	+	+	-	+	+	+
<i>Lysimachia arvensis</i>	Scarlet Pimpernel	-	-	+	+	-	-	-	+
<i>Lysimachia minima</i>	Chaffweed	axio	-	-	+	-	+	-	-
<i>Malva moschata</i>	Musk-mallow	-	-	-	+	-	+	+	+
<i>Malva sylvestris</i>	Common Mallow	-	+	+	+	-	+	+	+
<i>Medicago lupulina</i>	Black Medick	-	+	+	+	+	+	+	+
<i>Melica uniflora</i>	Wood Melick	axio	+	+	+	-	+	+	+
<i>Melissa officinalis</i>	Balm	-	-	-	+	-	-	-	+
<i>Mentha aquatica</i>	Water Mint	-	-	-	+	-	+	+	+
<i>Mentha x piperita</i>	Peppermint	-	-	-	+	-	-	-	+
<i>Mercurialis perennis</i>	Dog's Mercury	-	+	+	+	-	+	+	+
<i>Milium effusum</i>	Wood Millet	axio	-	-	+	+	-	-	+
<i>Moehringia trinervia</i>	Three-nerved Sandwort	-	+	+	+	-	+	+	+
<i>Mycelis muralis</i>	Wall Lettuce	-	+	+	+	-	+	+	+
<i>Myosotis arvensis</i>	Field Forget-me-not	-	+	+	+	-	+	+	+
<i>Myosotis ramosissima</i>	Early Forget-me-not	axio	+	-	-	-	-	-	+
<i>Neotinea ustulata</i>	Burnt Orchid	axio	+	-	+	+	+	-	+
<i>Neottia ovata</i>	Common Twayblade	axio	+	+	+	-	+	+	+
<i>Odontites vernus</i>	Red Bartsia	-	+	-	+	-	+	+	+
<i>Ononis repens</i>	Common Restharrow	axio	-	-	+	-	-	+	+
<i>Onopordum acanthium</i>	Cotton Thistle	-	-	-	+	-	-	-	+
<i>Ophioglossum vulgatum</i>	Adder's-tongue	axio	-	+	+	-	+	-	+
<i>Ophrys apifera</i>	Bee Orchid	-	+	+	+	+	+	+	+
<i>Ophrys fuciflora</i>	Late Spider-orchid	axio	-	-	+	+	+	+	+
<i>Ophrys insectifera</i>	Fly Orchid	axio	-	+	+	+	+	+	+
<i>Ophrys insectifera x sphegodes</i>	Fly x Early Spider Orchid	-	-	+	+	+	-	-	-
<i>Ophrys sphegodes</i>	Early Spider-orchid	axio	+	+	+	+	+	+	+
<i>Ophrys x albertiana</i>	Bee x Late Spider Orchid	-	-	-	+	-	-	-	+
<i>Orchis anthropophora</i>	Man Orchid	axio	+	+	+	+	+	+	+
<i>Orchis mascula</i>	Early-purple Orchid	axio	+	+	+	-	+	+	+
<i>Orchis purpurea</i>	Lady Orchid	axio	-	-	+	+	+	+	+
<i>Origanum vulgare</i>	Wild Marjoram	-	+	+	+	+	+	+	+
<i>Oxalis acetosella</i>	Wood-sorrel	axio	-	-	+	-	+	+	+
<i>Oxalis articulata</i>	Pink-sorrel	-	-	-	+	-	-	-	+
<i>Paris quadrifolia</i>	Herb Paris	axio	-	-	+	-	+	+	+
<i>Pastinaca sativa</i>	Wild Parsnip	-	+	-	+	-	+	+	+
<i>Persicaria hydropiper</i>	Water-pepper	-	-	+	-	-	+	-	+
<i>Persicaria maculosa</i>	Redshank	-	-	+	-	-	+	+	+
<i>Phleum bertolonii</i>	Smaller Cat's-tail	-	+	+	+	-	-	+	+
<i>Phleum pratense</i>	Timothy	-	-	+	+	-	-	-	+
<i>Picris hieracioides</i>	Hawkweed Oxtongue	-	+	+	+	+	+	+	+
<i>Pilosella officinarum</i>	Mouse-ear-hawkweed	-	+	+	+	+	+	+	+
<i>Pimpinella major</i>	Greater Burnet-saxifrage	axio	-	-	+	+	-	-	-
<i>Pimpinella saxifraga</i>	Burnet-saxifrage	axio	+	+	+	+	+	+	+
<i>Plantago lanceolata</i>	Ribwort Plantain	-	+	+	+	+	+	+	+
<i>Plantago major</i>	Greater Plantain	-	+	+	+	-	+	+	+

Plantago media	Hoary Plantain	axio	+	+	+	+	+	+	+
Platanthera chlorantha	Greater Butterfly-orchid	axio	+	-	+	-	+	-	+
Poa annua	Annual Meadow-grass	-	+	+	+	-	+	+	+
Poa compressa	Flattened Meadow-grass	axio	+	-	+	-	-	-	+
Poa humilis	Spreading Meadow-grass	-	+	+	+	-	-	+	+
Poa nemoralis	Wood Meadow-grass	axio	-	+	+	-	+	+	+
Poa pratensis	Smooth Meadow-grass	-	+	+	+	-	+	+	+
Poa trivialis	Rough Meadow-grass	-	+	+	+	-	+	+	+
Polygala amarella	Dwarf Milkwort	axio	+	+	+	+	-	-	-
Polygala serpyllifolia	Heath Milkwort	axio	-	-	+	+	-	-	-
Polygala vulgaris	Common Milkwort	axio	+	+	+	+	+	+	+
Polygala vulgaris x amarella	Common x Dwarf Milkwort	-	+	-	-	+	-	-	-
Polygonum aviculare	Knotgrass	-	+	+	+	-	+	+	+
Polystichum aculeatum	Hard Shield-fern	axio	-	+	+	-	+	+	+
Polystichum setiferum	Soft Shield-fern	axio	-	+	+	-	+	+	+
Populus tremula	Aspen	-	-	+	-	-	+	-	+
Potentilla anserina	Silverweed	-	+	+	+	-	+	+	+
Potentilla reptans	Creeping Cinquefoil	-	+	+	+	+	+	+	+
Potentilla sterilis	Barren Strawberry	-	-	+	+	-	+	+	+
Potentilla x mixta	Hybrid Cinquefoil	-	-	+	-	-	-	-	+
Poterium sanguisorba	Salad Burnet	axio	+	+	+	+	+	+	+
Primula veris	Cowslip	-	+	+	+	+	+	+	+
Primula vulgaris	Primrose	-	+	+	+	-	+	+	+
Primula x polyantha	False Oxlip	-	-	+	+	+	-	-	+
Prunella vulgaris	Selfheal	-	+	+	+	+	+	+	+
Prunus avium	Wild Cherry	-	+	+	+	-	+	+	+
Prunus domestica	Wild Plum	-	+	+	+	+	+	-	+
Prunus spinosa	Blackthorn	-	+	+	+	-	+	+	+
Pteridium aquilinum	Bracken	-	+	+	+	-	+	+	+
Pulicaria dysenterica	Fleabane	-	-	-	+	-	+	+	+
Quercus cerris	Turkey Oak	-	+	+	+	-	+	+	+
Quercus ilex	Holm Oak	-	+	+	-	-	-	-	+
Quercus robur	Pedunculate Oak	-	+	+	+	-	+	+	+
Ranunculus acris	Meadow Buttercup	-	+	+	+	-	+	+	+
Ranunculus bulbosus	Bulbous Buttercup	-	+	+	+	+	+	+	+
Ranunculus peltatus	Pond Water-crowfoot	axio	-	+	-	-	-	-	+
Ranunculus repens	Creeping Buttercup	-	+	+	+	+	+	+	+
Reseda lutea	Wild Mignonette	-	+	+	+	-	+	+	+
Reseda luteola	Weld	-	-	-	+	-	-	-	+
Rhamnus cathartica	Buckthorn	axio	+	+	+	+	+	+	+
Rhinanthus minor	Yellow-rattle	axio	-	-	+	-	+	+	+
Ribes rubrum	Red Currant	-	+	+	+	+	+	+	+
Ribes uva-crispa	Gooseberry	-	+	+	+	-	+	+	+
Rosa arvensis	Field Rose	-	+	+	+	-	+	+	+
Rosa canina	Dog Rose	-	+	+	+	-	+	+	+
Rosa micrantha	Small-flowered Sweet-briar	axio	+	+	+	-	+	+	+
Rosa tomentosa	Harsh Downy-rose	axio	-	-	+	-	-	-	+
Rosa x dumalis	Hybrid Dog-rose	-	-	-	+	-	-	-	+
Rubus caesius	Dewberry	-	+	+	+	-	+	+	+
Rubus fruticosus	Bramble	-	+	+	+	-	+	+	+
Rubus idaeus	Raspberry	-	-	-	+	-	+	-	+
Rubus phoenicolasius	Japanese Wineberry	-	-	-	+	-	-	-	+
Rumex acetosa	Common Sorrel	-	+	+	+	-	+	+	+
Rumex crispus	Curled Dock	-	+	+	+	-	+	+	+
Rumex obtusifolius	Broad-leaved Dock	-	+	+	+	-	+	+	+
Rumex sanguineus	Wood Dock	-	+	+	+	-	+	+	+
Ruscus aculeatus	Butcher's-broom	axio	-	+	-	-	+	-	+
Salix caprea	Goat Willow	-	+	+	+	-	+	+	+
Sambucus nigra	Elder	-	+	+	+	-	+	+	+
Scabiosa columbaria	Small Scabious	axio	+	+	+	+	+	+	+
Schedonorus arundinaceus	Tall Fescue	-	+	+	+	-	+	+	+
Schedonorus giganteus	Giant Fescue	-	-	-	+	-	-	-	+
Schedonorus pratensis	Meadow Fescue	-	-	-	+	-	+	+	+
Scorzoneroideis autumnalis	Autumnal Hawkbit	-	+	+	+	-	+	+	+
Scrophularia auriculata	Water Figwort	-	-	-	+	-	+	+	+
Scrophularia nodosa	Common Figwort	-	-	+	+	-	+	+	+
Sherardia arvensis	Field Madder	-	-	+	-	-	+	+	+
Silene dioica	Red Campion	-	+	+	+	-	+	+	+
Silene vulgaris	Bladder Campion	axio	-	-	+	-	-	-	+
Sisymbrium officinale	Hedge Mustard	-	-	-	+	-	-	-	+
Solanum dulcamara	Bittersweet	-	+	+	+	-	+	+	+



<i>Sonchus arvensis</i>	Perennial Sow-thistle	-	+	+	+	-	+	+	+
<i>Sonchus asper</i>	Prickly Sow-thistle	-	+	+	+	-	+	+	+
<i>Sonchus oleraceus</i>	Smooth Sow-thistle	-	+	+	+	-	+	+	+
<i>Sorbus aria</i>	Whitebeam	-	+	+	+	-	+	+	+
<i>Spiranthes spiralis</i>	Autumn Lady's-tresses	axio	-	+	+	+	+	-	+
<i>Stachys sylvatica</i>	Hedge Woundwort	-	+	+	+	-	+	+	+
<i>Stellaria graminea</i>	Lesser Stitchwort	-	+	+	+	-	+	+	+
<i>Stellaria holostea</i>	Greater Stitchwort	-	-	+	-	-	+	-	+
<i>Stellaria media</i>	Chickweed	-	+	-	-	-	-	+	+
<i>Succisa pratensis</i>	Devil's-bit Scabious	axio	+	+	+	+	+	+	+
<i>Symphoricarpos albus</i>	Snowberry	-	-	-	+	-	-	-	+
<i>Tamus communis</i>	Black Bryony	-	+	+	+	-	+	+	+
<i>Taraxacum officinale</i>	Dandelion	-	+	+	+	+	+	+	+
<i>Taxus baccata</i>	Yew	-	+	+	+	-	+	+	+
<i>Teucrium scorodonia</i>	Wood Sage	-	+	+	+	-	+	+	+
<i>Thymus drucei</i>	Wild Thyme	axio	+	+	+	+	+	+	+
<i>Thymus pulegioides</i>	Large Thyme	axio	+	+	+	+	+	+	+
<i>Tilia cordata</i>	Small-leaved Lime	axio	-	-	+	-	-	-	+
<i>Tilia platyphyllos</i>	Large-leaved Lime	-	-	-	+	-	-	-	+
<i>Tilia x europaea</i>	Lime	-	-	-	+	-	+	-	+
<i>Torilis japonica</i>	Upright Hedge-parsley	-	+	+	+	-	+	+	+
<i>Tragopogon pratensis</i>	Goat's-beard	-	+	+	+	-	+	+	+
<i>Trifolium campestre</i>	Hop Trefoil	-	+	-	-	-	-	-	+
<i>Trifolium dubium</i>	Lesser Trefoil	-	+	+	+	-	+	+	+
<i>Trifolium medium</i>	Zigzag Clover	axio	+	-	+	-	+	-	+
<i>Trifolium pratense</i>	Red Clover	-	+	+	+	+	+	+	+
<i>Trifolium repens</i>	White Clover	-	+	+	+	+	+	+	+
<i>Tripleurospermum inodorum</i>	Scentless Mayweed	-	-	-	+	-	-	-	+
<i>Trisetum flavescens</i>	Yellow Oat-grass	-	+	+	+	-	+	+	+
<i>Ulmus minor</i>	Small-leaved Elm	-	-	-	+	-	-	-	+
<i>Ulmus procera</i>	English Elm	-	+	-	+	-	+	-	+
<i>Urtica dioica</i>	Stinging Nettle	-	+	+	+	-	+	+	+
<i>Verbascum thapsus</i>	Great Mullein	-	+	+	+	-	+	+	+
<i>Verbena officinalis</i>	Vervain	-	-	+	+	-	+	+	+
<i>Veronica arvensis</i>	Wall Speedwell	-	+	+	+	-	+	+	+
<i>Veronica chamaedrys</i>	Germander Speedwell	-	+	+	+	+	+	+	+
<i>Veronica filiformis</i>	Slender Speedwell	-	+	+	+	-	+	+	+
<i>Veronica hederifolia</i>	Ivy-leaved Speedwell	-	+	+	+	-	+	+	+
<i>Veronica montana</i>	Wood Speedwell	axio	+	+	+	-	+	+	+
<i>Veronica officinalis</i>	Heath Speedwell	axio	-	+	+	-	+	+	+
<i>Veronica persica</i>	Common Field-speedwell	-	+	+	+	-	+	+	+
<i>Veronica serpyllifolia</i>	Thyme-leaved Speedwell	-	-	+	-	-	+	-	+
<i>Viburnum lantana</i>	Wayfaring-tree	-	+	+	+	-	+	+	+
<i>Viburnum opulus</i>	Guelder-rose	-	+	+	+	-	+	+	+
<i>Vicia cracca</i>	Tufted Vetch	-	+	+	+	-	+	-	+
<i>Vicia sepium</i>	Bush Vetch	-	+	+	+	-	+	+	+
<i>Vinca major</i>	Greater Periwinkle	-	-	-	+	-	+	-	+
<i>Viola hirta</i>	Hairy Violet	axio	+	+	+	+	+	+	+
<i>Viola odorata</i>	Sweet Violet	-	-	-	+	-	-	-	+
<i>Viola reichenbachiana</i>	Early Dog-violet	axio	+	+	+	-	+	+	+
<i>Viola riviniana</i>	Common Dog-violet	-	+	+	+	-	+	+	+
<i>Viscum album</i>	Mistletoe	-	-	-	+	-	-	-	+
		103	247	261	363	109	286	265	377
Axiophytes			60	63	95	52	77	70	95

## Appendix 2: vegetation data

Table 1: quadrats from the NVC database  
(see the section on vegetation for details)

	Q1082	Q1083	Q1084	Q1085	Q1087	Q1089	Q1091	Q1100	Q1103	Q1120	Q1121	Q1147
<i>Acer campestre</i>	-	-	-	-	-	6	-	-	-	3	-	-
<i>Achillea millefolium</i>	-	-	3	4	3	3	3	-	2	-	-	-
<i>Agrostis capillaris</i>	-	-	3	5	6	-	4	-	-	-	-	-
<i>Alliaria petiolata</i>	-	-	-	-	-	3	-	-	-	-	-	-
<i>Anemone nemorosa</i>	-	-	-	-	-	-	-	-	-	2	7	-
<i>Anisantha sterilis</i>	-	-	-	-	-	2	-	-	-	-	-	-
<i>Anthriscus sylvestris</i>	-	-	-	-	-	4	-	-	-	-	-	-
<i>Aphanes arvensis</i>	-	-	-	-	-	-	-	-	-	-	-	1
<i>Arctium minus</i>	-	-	-	-	-	3	-	-	-	-	-	-
<i>Arrhenatherum elatius</i>	-	-	-	-	-	6	4	-	-	-	-	-
<i>Arum maculatum</i>	-	3	-	-	-	-	-	-	-	2	-	-
<i>Asperula cynanchica</i>	-	-	-	-	-	-	-	-	2	-	-	-
<i>Avenula pratensis</i>	3	-	4	3	-	-	-	-	4	-	-	2
<i>Avenula pubescens</i>	-	-	3	3	-	-	-	-	-	-	-	-
<i>Bellis perennis</i>	-	-	3	-	-	-	-	-	2	-	-	-
<i>Blackstonia perfoliata</i>	-	-	-	-	2	-	-	2	-	-	-	-
<i>Brachypodium rupestre</i>	9	-	-	5	7	-	9	5	6	-	-	-
<i>Brachypodium sylvaticum</i>	-	-	-	-	-	6	-	-	-	-	-	-
<i>Brachythecium rutabulum</i>	-	3	-	-	-	-	-	-	-	3	-	-
<i>Briza media</i>	-	-	3	4	5	-	3	4	4	-	-	5
<i>Bromopsis erecta</i>	-	-	-	-	-	-	-	-	-	-	-	6
<i>Campanula rotundifolia</i>	-	-	-	-	3	-	-	2	2	-	-	2
<i>Carex caryophyllaea</i>	-	-	-	-	-	-	-	2	2	-	-	3
<i>Carex flacca</i>	3	-	3	-	3	-	-	2	4	-	-	3
<i>Carlina vulgaris</i>	-	-	-	-	-	-	-	2	-	-	-	1
<i>Centaurea nigra</i>	-	-	2	-	3	-	3	2	2	-	-	2
<i>Centaureum erythraea</i>	-	-	-	-	-	-	-	2	-	-	-	-
<i>Cerastium fontanum</i>	-	-	-	2	-	-	-	-	-	-	-	-
<i>Ceratodon purpureus</i>	-	-	3	-	-	-	-	-	-	-	-	-
<i>Cirsium acaule</i>	-	-	3	3	3	-	4	4	5	-	-	1
<i>Clematis vitalba</i>	-	2	-	-	-	3	-	-	-	-	-	-
<i>Cornus sanguinea</i>	-	-	-	-	-	4	-	-	-	-	-	-
<i>Corylus avellana</i>	-	8	-	-	-	6	-	-	-	5	3	-
<i>Crataegus monogyna</i>	2	-	-	-	3	4	-	-	-	3	3	-
<i>Cruciata laevipes</i>	-	-	-	-	-	-	3	-	-	-	-	-
<i>Ctenidium molluscum</i>	-	-	-	-	-	-	-	-	-	-	-	3
<i>Cynosurus cristatus</i>	-	-	-	-	-	-	-	-	4	-	-	-
<i>Dactylis glomerata</i>	3	-	2	3	5	-	3	2	2	-	-	-
<i>Euonymus europaeus</i>	-	-	-	-	-	-	-	-	-	3	-	-
<i>Euphrasia nemorosa</i>	-	-	-	-	-	-	-	2	-	-	-	-
<i>Fagus sylvatica</i>	-	-	-	-	-	-	-	-	-	2	8	-
<i>Festuca ovina</i>	-	-	4	6	7	-	3	4	6	-	-	5
<i>Filipendula vulgaris</i>	-	-	-	-	-	-	-	-	4	-	-	-
<i>Fissidens dubius</i>	-	-	-	-	-	-	-	2	-	-	-	-
<i>Fissidens taxifolius</i>	-	-	-	-	-	-	-	-	-	3	-	-
<i>Fraxinus excelsior</i>	3	-	-	-	-	-	-	-	-	4	5	-
<i>Galium album</i>	-	-	-	-	-	3	-	-	-	-	-	-
<i>Galium aparine</i>	-	-	-	-	-	4	-	-	-	-	-	-
<i>Galium verum</i>	3	-	-	3	-	-	-	-	2	-	-	-
<i>Gentianella amarella</i>	-	-	-	-	-	-	-	2	2	-	-	-
<i>Geranium robertianum</i>	-	-	-	-	-	-	-	-	-	2	-	-
<i>Geum urbanum</i>	-	-	-	-	-	4	-	-	-	-	-	-
<i>Glechoma hederacea</i>	-	3	-	-	-	3	2	-	-	-	-	-
<i>Gymnadenia conopsea</i>	-	-	-	-	-	-	-	-	-	-	-	2
<i>Hedera helix</i>	-	-	-	-	-	-	-	-	-	5	-	-
<i>Helianthemum nummularium</i>	7	-	7	-	4	-	5	2	5	-	-	4
<i>Hippocrepis comosa</i>	3	-	-	-	-	-	-	-	2	-	-	5
<i>Homalothecium lutescens</i>	-	-	2	-	-	-	-	-	-	-	-	-
<i>Hyacinthoides non-scripta</i>	-	-	-	-	-	-	-	-	-	3	8	-
<i>Hypericum perforatum</i>	3	-	-	-	-	-	3	-	-	-	-	-
<i>Hypochaeris radicata</i>	-	-	-	-	3	-	-	-	-	-	-	-

Ilex aquifolium	-	-	-	-	-	-	-	-	-	3	-	-
Iris foetidissima	-	-	-	-	-	-	-	-	-	3	-	-
Kindbergia praelonga	-	3	-	-	-	-	-	-	-	3	-	-
Koeleria macrantha	-	-	4	-	4	-	3	2	-	-	-	1
Lamiastrum galeobdolon	-	-	-	-	-	3	-	-	-	-	-	-
Lamium album	-	-	-	-	-	4	-	-	-	-	-	-
Leontodon hispidus	-	-	-	2	-	-	-	2	2	-	-	2
Leontodon saxatilis	-	-	-	-	-	-	-	2	-	-	-	-
Ligustrum vulgare	-	5	-	-	-	-	-	-	-	-	-	-
Linum catharticum	-	-	-	-	3	-	-	2	2	-	-	2
Lotus corniculatus	3	-	3	4	4	-	3	2	4	-	-	3
Melica uniflora	-	-	-	-	-	-	-	-	-	4	-	-
Mercurialis perennis	-	8	-	-	-	4	-	-	-	9	4	-
Neckera crispa	-	-	-	-	-	-	-	-	-	-	-	2
Orchis anthropophora	-	-	-	-	-	-	-	-	-	-	-	2
Origanum vulgare	4	-	-	-	4	-	5	-	-	-	-	-
Oxyrrhynchium hians	-	-	-	-	-	-	-	-	-	-	-	2
Pastinaca sativa	-	-	-	-	-	-	4	-	-	-	-	-
Picris hieracioides	-	-	-	-	-	-	-	2	-	-	-	-
Pilosella officinarum	-	-	5	-	-	-	-	-	2	-	-	3
Pimpinella saxifraga	3	-	-	3	-	-	3	2	2	-	-	1
Plantago lanceolata	-	-	3	2	-	3	-	-	4	-	-	1
Plantago media	-	-	-	-	-	-	-	-	2	-	-	1
Polygala vulgaris	4	-	-	-	4	-	-	-	2	-	-	2
Poterium sanguisorba	6	-	7	4	5	-	5	4	4	-	-	2
Primula veris	-	-	-	-	3	-	-	-	-	-	-	-
Prunella vulgaris	-	-	-	-	-	-	-	2	2	-	-	2
Prunus domestica	-	-	-	-	-	3	-	-	-	-	-	-
Prunus spinosa	-	-	-	-	-	5	-	-	-	2	-	-
Pseudoscleropodium purum	-	-	-	-	-	-	-	-	2	-	-	-
Quercus robur	-	-	-	-	-	-	-	-	-	9	5	-
Ranunculus bulbosus	-	-	-	-	-	-	-	-	2	-	-	1
Ranunculus repens	-	-	-	-	2	-	-	-	-	-	-	-
Rosa canina	-	-	-	-	-	6	-	-	-	3	-	-
Rubus fruticosus	-	3	-	-	-	4	-	-	-	8	4	-
Ruscus aculeatus	-	-	-	-	-	-	-	-	-	-	3	-
Sambucus nigra	-	4	-	-	-	5	-	-	-	4	3	-
Scabiosa columbaria	-	-	-	-	-	-	-	2	2	-	-	1
Succisa pratensis	-	-	-	-	-	-	-	-	2	-	-	-
Tamus communis	-	-	-	-	-	5	-	-	-	3	-	-
Taraxacum officinale	-	-	2	3	-	-	-	-	-	-	-	2
Taxus baccata	-	-	-	-	-	-	-	-	-	2	6	-
Thymus drucei	-	-	2	-	-	-	-	-	-	-	-	2
Thymus pulegioides	-	-	-	-	-	-	-	4	2	-	-	-
Trifolium pratense	-	-	3	-	-	-	-	-	-	-	-	-
Trifolium repens	-	-	-	3	-	-	-	-	-	-	-	1
Urtica dioica	-	-	-	-	-	4	-	-	-	-	-	-
Veronica chamaedrys	-	-	-	3	-	-	-	-	-	-	-	-
Veronica officinalis	-	-	-	2	-	-	-	-	-	-	-	-
Veronica persica	-	-	-	4	-	-	3	-	-	-	-	-
Viburnum lantana	-	3	-	-	-	4	-	-	-	3	-	-
Viburnum opulus	-	-	-	-	-	-	-	-	-	2	-	-
Vicia sepium	-	-	-	-	-	5	-	-	-	-	-	-
Viola hirta	4	-	-	-	-	-	-	4	2	-	-	2
Weissia controversa	-	-	-	-	-	-	-	2	-	-	-	-

Table 2: selection of quadrats from the current survey

Quadrat	Habitat	Site	Comp.	GR	Date
Q1223	W8 Fraxinus excelsior woodland	Covert Wood	17	TR08534433	20 April 2020
Q1235	W8 Fraxinus excelsior woodland	Coombe Wood	28	TR08944950	24 April 2020
Q1245	MG5 Festuca rubra grassland	Rattendane Coombe	21	TR08374391	15 May 2020
Q1247	W8 Fraxinus excelsior woodland	Newgate Scrubs	13	TR07694492	22 May 2020
Q1250	CG2 Festuca ovina grassland	Denton's Field	3	TR07394550	31 May 2020
Q1254	W8 Fraxinus excelsior woodland	Pickersdane Scrubs	1	TR07634563	9 June 2020
Q1255	CG4 Brachypodium rupestre grassland	Crown Field	34	TR07194657	9 June 2020
Q1258	CG5 Bromopsis erecta grassland	Crown Field	34	TR07174648	9 June 2020
Q1265	CG2 Festuca ovina grassland	Aldglose Down	24	TR08454381	1 July 2020
Q1268	MG1 Arrhenatherum elatius grassland	Giddy Horn	22	TR08464401	6 July 2020
Q1273	MG1 Arrhenatherum elatius grassland	Fishponds Down	14	TR08074449	20 July 2020
Q1276	CG5 Bromopsis erecta grassland	Winchcombe Down	29	TR08944967	10 August 2020

	Q1223	Q1235	Q1245	Q1247	Q1250	Q1254	Q1255	Q1258	Q1265	Q1268	Q1273	Q1276
Acer campestre	2	4	-	-	-	-	-	-	-	-	-	-
Acer pseudoplatanus	-	-	-	-	-	4	-	-	-	-	-	-
Achillea millefolium	-	-	-	-	-	-	2	-	-	-	2	-
Adoxa moschatellina	-	5	-	-	-	-	-	-	-	-	-	-
Agrimonia eupatoria	-	-	1	-	-	-	-	-	-	-	1	-
Agrostis capillaris	-	-	5	-	-	-	-	-	-	-	-	-
Agrostis stolonifera	-	-	-	-	-	-	-	-	-	-	5	-
Ajuga reptans	-	1	-	-	-	-	-	-	-	-	-	-
Allium ursinum	8	-	-	4	-	-	-	-	-	-	-	-
Anacamptis pyramidalis	-	-	-	-	1	-	-	-	2	-	-	-
Anemone nemorosa	2	6	-	-	-	-	-	-	-	-	-	-
Anthoxanthum odoratum	-	-	-	-	-	-	6	1	-	-	-	-
Arrhenatherum elatius	-	-	-	-	-	-	-	-	-	2	6	-
Arum maculatum	1	2	-	2	-	1	-	-	-	-	-	-
Asperula cynanchica	-	-	-	-	-	-	-	-	-	-	-	2
Athyrium filix-femina	-	-	-	-	-	4	-	-	-	-	-	-
Avenula pubescens	-	-	-	-	2	-	-	1	3	-	-	-
Bellis perennis	-	-	2	-	-	-	-	-	-	-	-	-
Betula pendula	-	-	-	-	-	4	-	-	-	-	-	-
Brachypodium rupestre	-	-	5	-	3	-	5	8	8	7	-	8
Brachypodium sylvaticum	-	-	-	1	-	-	-	-	-	-	-	-
Brachythecium rutabulum	-	-	-	-	-	-	-	-	3	-	-	2
Briza media	-	-	4	-	4	-	-	2	5	-	-	4
Bromopsis erecta	-	-	-	-	-	-	-	6	-	-	-	5
Carduus crispus	-	-	-	-	-	-	-	-	-	-	1	-
Carex flacca	-	-	5	-	1	-	3	-	4	-	-	2
Carex sylvatica	-	3	-	-	-	-	-	-	-	-	-	-
Catapodium rigidum	-	-	-	-	2	-	-	-	-	-	-	-
Centaurea nigra	-	-	-	-	-	-	4	1	-	-	-	1
Centaurea scabiosa	-	-	-	-	-	-	-	-	2	-	-	-
Centaureum erythraea	-	-	-	-	-	-	-	-	1	-	-	-
Cephalanthera damasonium	-	-	-	2	-	-	-	-	-	-	-	-
Circaea lutetiana	-	-	-	-	-	7	-	-	-	-	-	-
Cirsium acaule	-	-	-	-	4	-	2	1	4	-	-	2
Cirsium arvense	-	-	-	-	-	-	-	-	-	-	4	-
Cirsium vulgare	-	-	-	-	-	-	-	-	-	-	1	-
Clematis vitalba	-	-	-	-	-	2	-	-	-	-	-	-
Clinopodium vulgare	-	-	-	-	-	-	-	-	-	2	-	-
Convolvulus arvensis	-	-	-	-	-	-	-	-	-	-	4	-
Cornus sanguinea	-	-	-	4	-	-	-	-	-	-	-	-
Corylus avellana	9	5	-	9	-	8	-	-	-	-	-	-
Crataegus monogyna	1	6	-	4	1	5	-	-	-	-	-	1
Crepis capillaris	-	-	-	-	-	-	-	-	-	2	-	-
Cruciata laevipes	-	-	-	-	-	-	-	-	-	1	5	-
Cynoglossum officinale	-	-	-	-	-	-	-	-	-	4	-	-
Cynosurus cristatus	-	-	-	-	-	-	2	-	-	-	-	-
Dactylis glomerata	-	-	2	-	2	-	-	2	-	2	5	-
Dactylorhiza fuchsii	-	-	1	-	3	-	-	-	-	-	-	-
Danthonia decumbens	-	-	-	-	-	-	2	-	-	-	-	-
Daphne laureola	-	-	-	-	-	-	-	-	-	1	-	-
Dryopteris affinis	-	-	-	-	-	4	-	-	-	-	-	-



Dryopteris dilatata	-	-	-	-	-	5	-	-	-	-	-	-
Dryopteris filix-mas	-	-	-	-	-	4	-	-	-	-	-	-
Echium vulgare	-	-	-	-	-	-	-	-	-	-	1	-
Eupatorium cannabinum	-	-	-	-	-	-	-	-	-	5	-	-
Euphrasia officinalis	-	-	-	-	4	-	-	-	-	-	-	-
Fagus sylvatica	-	7	-	-	-	-	-	-	-	-	-	-
Festuca ovina	-	-	-	-	5	-	8	-	5	-	-	-
Festuca rubra	-	-	5	-	1	-	4	-	-	-	-	-
Filipendula vulgaris	-	-	-	-	-	-	4	4	-	-	-	-
Fraxinus excelsior	5	6	-	4	-	5	-	-	-	-	-	-
Galium album	-	-	2	-	2	-	-	1	-	-	-	-
Galium aparine	-	3	-	1	-	-	-	-	-	-	-	-
Galium verum	-	-	4	-	4	-	4	2	2	-	-	-
Gentianella amarella	-	-	-	-	-	-	-	-	1	-	-	-
Geranium robertianum	-	1	-	-	-	-	-	-	-	-	-	-
Geum urbanum	-	-	-	-	-	3	-	-	-	-	-	-
Glechoma hederacea	-	-	-	-	-	-	-	-	-	2	-	-
Gymnadenia conopsea	-	-	-	-	-	-	-	-	2	-	-	-
Helianthemum nummularium	-	-	-	-	-	-	5	4	-	-	-	4
Hippocrepis comosa	-	-	-	-	-	-	-	4	2	-	-	-
Holcus lanatus	-	-	-	-	-	-	4	-	-	-	5	-
Hyacinthoides non-scripta	2	7	-	-	-	-	-	-	-	-	-	-
Hypericum hirsutum	-	-	-	2	-	-	-	-	-	2	-	-
Hypericum perforatum	-	-	-	-	4	-	-	-	1	-	-	-
Inula conyzae	-	-	-	-	-	-	-	-	-	4	-	-
Iris foetidissima	-	4	-	1	-	-	-	-	-	1	-	-
Jacobaea vulgaris	-	-	-	-	-	-	-	-	-	4	1	-
Juglans regia	-	-	-	-	-	-	-	-	-	-	1	-
Knautia arvensis	-	-	-	-	-	-	-	-	4	-	-	-
Koeleria macrantha	-	-	-	-	-	-	2	-	-	-	-	-
Leontodon hispidus	-	-	-	-	1	-	-	-	2	-	-	4
Linum catharticum	-	-	3	-	3	-	-	-	3	-	-	-
Lotus corniculatus	-	-	4	-	3	-	4	2	4	-	-	3
Luzula campestris	-	-	-	-	-	-	4	-	-	-	-	-
Malva moschata	-	-	-	-	-	-	-	-	-	-	1	-
Medicago lupulina	-	-	-	-	2	-	-	-	1	-	-	-
Melica uniflora	-	1	-	-	-	-	-	-	-	-	-	-
Melissa officinalis	-	-	-	-	-	-	-	-	-	-	1	-
Mentha x piperita	-	-	-	-	-	-	-	-	-	-	8	-
Mercurialis perennis	8	8	-	9	-	6	-	-	-	-	-	-
Moehringia trinervia	-	3	-	-	-	-	-	-	-	-	-	-
Neottia ovata	-	-	-	1	-	-	-	-	-	-	-	-
Odontites vernus	-	-	-	-	-	-	-	-	-	-	3	-
Ophioglossum vulgatum	-	-	4	-	-	-	-	-	-	-	-	-
Ophrys fuciflora	-	-	-	-	-	-	-	-	2	-	-	-
Ophrys insectifera	-	-	-	3	-	-	-	-	-	-	-	-
Orchis mascula	-	-	-	-	-	-	-	-	1	-	-	-
Origanum vulgare	-	-	2	-	4	-	-	2	1	-	4	-
Paris quadrifolia	4	-	-	-	-	-	-	-	-	-	-	-
Pilosella officinarum	-	-	-	-	3	-	2	-	4	-	-	-
Pimpinella saxifraga	-	-	-	-	-	-	-	-	-	-	-	1
Plantago lanceolata	-	-	1	-	5	-	4	-	-	-	1	2
Poa compressa	-	-	-	-	3	-	-	-	-	-	-	-
Poa pratensis	3	3	-	-	-	-	-	-	-	-	-	-
Poa trivialis	-	-	-	-	-	3	-	-	-	-	-	-
Polygala vulgaris	-	-	2	-	1	-	-	-	1	-	-	-
Potentilla anserina	-	-	-	-	-	-	-	-	-	-	4	-
Potentilla reptans	-	-	1	-	-	-	-	-	-	-	-	-
Potentilla sterilis	-	-	-	-	4	-	-	-	-	-	-	-
Poterium sanguisorba	-	-	2	-	3	-	4	4	4	-	-	4
Primula veris	-	-	1	-	-	-	-	-	-	-	-	4
Primula vulgaris	-	2	-	-	-	-	-	-	-	-	-	-
Prunella vulgaris	-	-	-	-	-	-	-	-	-	1	1	-
Prunus spinosa	-	-	-	-	-	2	-	-	-	-	-	-
Pseudoscleropodium purum	-	-	-	-	-	-	-	-	-	-	-	3
Quercus ilex	-	-	-	-	-	-	-	1	-	-	-	1
Quercus robur	-	-	-	4	-	5	-	-	-	-	-	-
Ranunculus bulbosus	-	-	5	-	2	-	1	-	1	-	-	-
Reseda lutea	-	-	-	-	-	-	-	-	-	-	1	-
Rhamnus cathartica	-	-	-	-	-	-	-	-	-	5	-	-
Rosa canina	-	-	-	-	3	-	-	-	-	-	-	-

Rubus fruticosus	1	4	-	1	-	6	-	-	-	4	-	-
Rumex acetosa	-	-	-	-	-	-	4	-	-	-	-	-
Sambucus nigra	1	5	-	2	-	6	-	-	-	-	-	-
Scabiosa columbaria	-	-	-	-	-	-	-	-	-	-	-	1
Sonchus oleraceus	-	-	-	-	-	-	-	1	-	2	-	-
Sorbus aria	4	-	-	-	-	-	-	-	-	-	-	-
Succisa pratensis	-	-	-	-	-	-	-	-	2	-	-	-
Tamus communis	-	-	-	1	-	-	-	-	-	-	-	-
Taraxacum officinale	-	-	-	-	-	-	1	-	-	-	-	-
Teucrium scorodonia	-	-	-	-	-	-	-	-	-	5	-	-
Thymus drucei	-	-	-	-	-	-	-	-	2	-	-	4
Thymus pulegioides	-	-	-	-	-	-	1	-	-	-	-	-
Trifolium pratense	-	-	-	-	-	-	-	-	-	-	2	-
Trifolium repens	-	-	2	-	-	-	-	-	-	-	2	-
Trisetum flavescens	-	-	-	-	4	-	3	2	-	-	-	-
Ulmus minor	-	-	-	5	-	-	-	-	-	-	-	-
Urtica dioica	1	-	-	1	-	3	-	-	-	-	2	-
Verbena officinalis	-	-	-	-	-	-	-	-	-	-	2	-
Veronica chamaedrys	-	-	-	-	3	-	-	-	-	-	-	-
Veronica hederifolia	-	1	-	-	-	-	-	-	-	-	-	-
Veronica montana	-	3	-	-	-	-	-	-	-	-	-	-
Viola hirta	-	-	-	-	2	-	-	-	1	1	-	4
Viola reichenbachiana	-	2	-	-	-	-	-	-	-	-	-	-
Viola riviniana	-	2	-	3	2	-	-	-	1	-	-	-

## Appendix 3: Experiments

### 1. Erosion of Chalk

According to Kerney, Brown & Chandler (1963), the rate of erosion of the chalk escarpment was extremely rapid for a short while after the last ice age, and since then has been virtually zero for 10,000 years. This seems to be to be rather counter-intuitive: chalk is a soft, porous rock which one would imagine would be easily dissolved by acid rainwater. One would expect it to erode rather rapidly. More importantly, perhaps, the grassland on the reserve surely depends on the chalk dissolving in water to produce the alkaline conditions required by the calcicoles that occur there. So, it is possible that Kerney's conclusions could be incorrect?

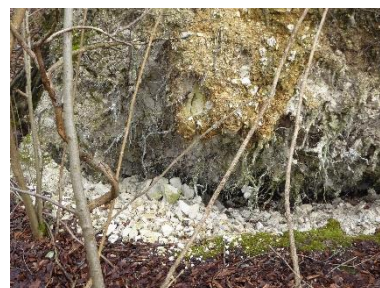
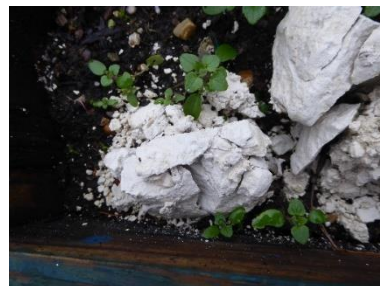
In a simple test of this, I gathered several lumps of chalk from the slopes of the reserve and placed them in various places in my garden in the winter. One lump was on a stone driveway, free-draining but exposed to the rain; one in a dry position sheltered from the rain, and one on damp soil in a flowerbed. When the temperature sank below zero the damp rock in the flowerbed shattered immediately, while the other two relatively dry lumps remained completely intact. Even after being covered with snow, the lump on the driveway exhibited only the slightest amount of surface weathering after the thaw.

Photographs: top, a lump of chalk on damp soil after just one night's frost (at -1 °C); middle, a second lump on a dry driveway after a whole winter of frost, snow and rain; bottom, shattered chalk from the root-ball of a wind-blown tree at Wye.

After more intense cold and snow in February 2021, there were some lumps of rock at Wye which had split in the frost. Typically, these pieces of stone had been lifted out of the ground on the root plates of a fallen trees; there was no sign of any shattering of exposed chalk faces or of rock underground.

It seems that the chalk is only broken by frost if it is both wet enough and sufficiently exposed to the cold. Even a thin layer of soil or vegetation is sufficient to prevent almost all weathering, and a quarry face is too free-draining to suffer much damage.

This means that the highly calcareous soil produced by crumbling and eroding chalk must be very uncommon now at Wye and, in turn, the plants (such as certain orchids, perhaps) that depend on such conditions, might be stressed. It is interesting to note that *Ophrys fuciflora* seems to be found mainly in places where chalk spoil from quarries has been dumped, and these areas undoubtedly had exposed fragments of chalk which have crumbled into a fine, soluble marl at some point in the past.



## 2. Scraping away the topsoil

In the 1990s (precise date unknown) a scrape was made in Denton's Field (compartment 3, TR07384554) which is about 3-4 m square. It looks as if a thin layer of topsoil was removed and piled to one side. The scrape now (in 2021) is still quite different to the surrounding land, which is a mosaic of *Brachypodium rupestre* grassland and scrub. It contains very little Tor Grass and has a short sward dominated by fine grasses and herbs. There are five species of orchid which are thriving in this small area. A quadrat recorded in this vegetation is given below.

### Quadrat 1251, TR07384554, 31 May 2020

Helianthemum nummularium	6	Brachypodium rupestre	3	Plantago lanceolata	2
Briza media	5	Galium verum	3	Dactylorhiza fuchsii	1
Festuca ovina	5	Linum catharticum	3	Fagus sylvatica	1
Lotus corniculatus	5	Orchis anthropophora	3	Neottia ovata	1
Poterium sanguisorba	5	Pilosella officinarum	3	Quercus robur	1
Avenula pubescens	4	Polygala vulgaris	3	Rubus fruticosus	1
Carex flacca	4	Anacamptis pyramidalis	2	Trifolium pratense	1
Gymnadenia conopsea	4	Euphrasia officinalis	2	Viburnum lantana	1
Ranunculus bulbosus	4	Leontodon saxatilis	2		
Succisa pratensis	4	Origanum vulgare	2		



This technique appears to be an effective way of reversing the build-up of organic matter in the soil and the succession to dense Tor Grass grassland or scrub. It also seems to have a reasonably long-lasting effect. It could be that higher levels of trampling and/or grazing have been encouraged in this area (there is a sign nearby directing people's attention to the orchids here) which could also have helped.

It would seem like a good idea to repeat this process in other areas to see if the effect is reproduced, and to document more completely the details of the experiment.



### 3. Ash Dieback

There have been many claims about the effects of Ash Dieback, which is caused by the fungus *Hymenoscyphus fraxineus*. When the disease was first found in Britain in 2012 there were some alarmist reports about the threat it posed, but since then organisations such as the Forestry Commission have toned down their warnings. Current advice (as of 2021) is that no action needs to be taken when infections are detected except if a tree is a threat to safety; there is no requirement to notify anyone of infections, and that a proportion of trees are likely to be resistant.

At Wye there is a good opportunity to document any changes to the vegetation as a result of ash dieback, as few trees were infected at the start of this survey. This is in contrast to the Dutch Elm Disease of the 1970s, about which we have no evidence. Although some large elms at Wye (both *Ulmus procera* and *U. minor*) have survived that disease, the presence of many diseased stumps suggest that quite a lot of trees were lost.

We currently have 21 quadrats containing *Fraxinus excelsior*, with cover ranging from 7 (50%) to 1 (<3%). Most of these are in W8 *F. excelsior* woodland with a few in CG4 or CG2 grassland. Three of them date from the 1970s, while the rest are from 2019-2020. These quadrats could be compared with samples recorded in the future to see how the vegetation composition has changed. It seems most likely that the proportion of ash in the canopy will decrease, perhaps, at least until resistant varieties of ash become more abundant.

The NVC communities seem unlikely to be affected unless large gaps in the canopy form (which currently seems unlikely), leading to an invasion of ruderal species.

One change that seems likely is that other tree species may become more abundant in the canopy layer. Oak and Turkey Oak are likely to benefit, and possibly Sycamore.

As of 2021, the main signs of ash dieback are in the woods at the top of the slope, at the top of C2 Pickersdane Scrubs and C17 Covert Wood, where large trees, which presumably also suffer from water stress, are clearly dying. Elsewhere, most trees are still healthy and there are numerous seedlings throughout, as usual.



Top of Covert Wood in August 2019

#### 4. Beechwood

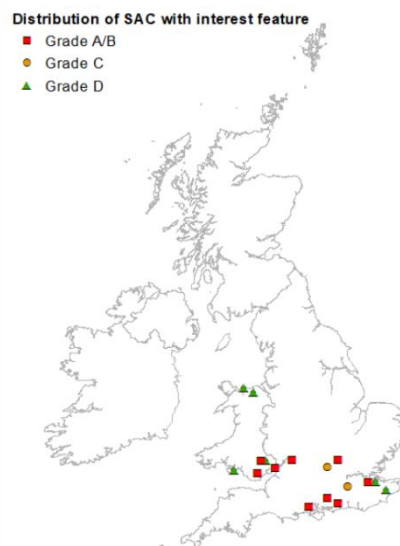
There have been debates about the possible presence of beechwoods (*Fagus sylvatica* woodland, W12 and/or W14) at Wye since it became a National Nature Reserve. Even before that time, in the 19<sup>th</sup> century, records refer to the beech woods at Wye (e.g., *Hypopitys monotropa*, 'under the beeches on the Wye hills,' W.R. Jeffrey, ca. 1899). There are several large trees, clearly over 100 years old, in the woods at Pickersdane Scrubs (C1), Giddy Horn (C20) and Coombe Wood (C28). On the Natural England map, Giddy Horn is shown as having a patch of W12 *Fagus sylvatica*-*Mercurialis perennis* woodland and Coombe Wood as being half W12 and half W14 *F. sylvatica*-*Rubus fruticosus* woodland. Beech woodland is (unlike ash woodland) a notable habitat under Annex 1 of the Habitats Directive and therefore warrants greater protection. The representation of beechwoods in British Special Areas for Conservation (SACs) is shown on the map below. The stands at Wye are only designated as Grade D woodland – i.e., present, but not particularly important, and not a feature for which the site was designated.

Others have made the case against there being natural beechwood at Wye. Duffield (1977) concluded that the beech trees were fairly recently planted and did not regenerate naturally. Although there are seedlings of beech to be found at Wye, he might be right.

My own observations suggest that there is little difference between the vegetation (primarily ground flora) of the beech stands and the rest of the woodland at Wye. It all comes out as W8 *Fraxinus excelsior* woodland if you analyse the quadrat data using computer, or if you key it out without giving undue attention to the canopy trees. Moreover, it does not *look like* beech woodland, which typically has thick leaf litter and dense shade in summer, with very little ground flora at all.

Only under the largest of the trees does one get the impression of characteristic beechwood, and this is consistent with the theory that they were planted.

Beech hangars are ancient woodlands which have avoided being felled because they occur on steep hillsides. The nearest one I can find to Wye is at Westwell Downs, a few miles away, on the other side of Ashford. It may be the only good example of a beech hangar in East Kent. The woodland at Westwell is quite unlike that at Wye, being situated on very steep slopes, with an almost complete absence of ground cover in the summer. On this evidence, I suggest that Duffield was correct in saying that there is no natural beechwood at Wye. However, the only material difference between beech wood and oak/ash wood is the type of canopy tree, so it would not be impossible to create good examples of W12 at Wye and Winchcombe by planting and managing for beech trees in these areas. W14 is not a possibility, because that is the analogue of W10 oak woodland, which occurs on circumneutral soils.



Distribution of *Asperulo-Fagetum* beech forests in SACs in Britain  
(<https://sac.jncc.gov.uk/habitat/H9130/map>)